Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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- Fish Pump — P.7
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~ *and 35 others*

JUL 1957 LIBRARY FISH & WILDLIFE SERVICE

Vol. 10 No. 6 **June 1957**

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U. S. Department of the Interior
Washington D. C.

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JOHN L. FARLEY, Director

Commercial Fisheries Abstracts

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
3	Preserved fish	8	Composition
4	Oils	9	Miscellaneous

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.118 BETTER WAY TO MEASURE CAN VACUUM

Seaman, M. L. (American Can Company, Maywood, Illinois)
Food Engineering 29, 90-91 (March 1957)

Introduction. --A modified puncture-type gage, the Doudera-Seaman gage, has all but eliminated the introduction of air into the can when measuring can vacuum. The new gage accomplishes this with a diaphragm which works to minimize the access of air.

Gage operation. --With the new modified gage, errors due to the introduction of air have been reduced to very small values, yet operation of the gage is easy and rapid. Operation of the new gage is based upon the action of a thin rubber diaphragm arranged so that vacuum applied to the upper and lower sides are in balance. The upper vacuum from an external source is applied via a central opening, whereas the lower vacuum is derived when the can being tested is punctured by the piercing stem. As the can is punctured, the diaphragm is pulled down and remains in this position until the gage vacuum reaches the can vacuum. Then the diaphragm moves upward to seal off the external vacuum source, and the gage of the instrument then registers can vacuum.

A small vent to the atmosphere now permits the gage vacuum to drop and the diaphragm to move downward to connect the gage to the vacuum source. This movement of the diaphragm evacuates the gage to can vacuum, and seals it off from the vacuum source. Actually, the drop in gage vacuum is very slight, and the gage continues to register can vacuum while the diaphragm describes a rapid fluttering action.

Opportunity for error. --The only error of consequence is the air that may be introduced into the can headspace with the new gage. This amount of air has been reduced to a mere 0.2 milliliters (ml.)

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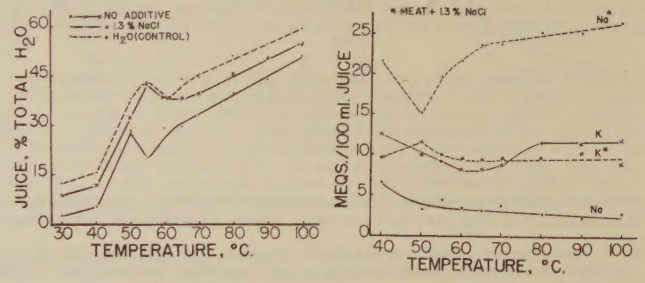
 ABSTRACTER: Martin Heerdt

0.35 CHANGES IN THE WATER-HOLDING CAPACITY AND CATIONIC SHIFTS DURING THE HEATING AND FREEZING AND THAWING OF MEAT AS REVEALED BY A SIMPLE CENTRIFUGAL METHOD FOR MEASURING SHRINKAGE

Wierbicki, Eugen; Kunkle, L. E.; and Deatherage, F. E. (The Ohio State University, Columbus)
Food Technology 11, 69-73 (February 1957)

The authors have devised a simplified centrifugal method for studying the water-holding capacity (shrinkage) of beef. This method has been used to study the effect of the following five factors on the water-holding capacity of beef: (1) added heat, (2) added water, (3) added salt, (4) post mortem age, and (5) freezing and thawing. This method separates beef from its expressed juices in order to permit a study of the pH changes and the ionic shifts which take place during processing.

Pronounced changes in beef proteins occur in the temperature range 40° C. to 70° C. The pH values of the beef itself also increase as the beef passes through this temperature range. The reactions that take



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 ABSTRACTER: Martin Heerdt

0.36 CRYSTALLINE CYTOCHROME C

Hagihara, Bunji; Tagawa, Kunio; Nozaki, Mitsuhiro; Morikawa, Ichiro; Yamashita, Jinpei; Okunuki, Kazuo
Nature 179, 249-251 (February 2, 1957)

Introduction. --Cytochrome c from baker's yeast, beef heart muscle, and pig heart muscle have been crystallized by Hagihara et al. (1956) as needles which sometimes are grouped into rosettes or leaflets. Very large and plate-like crystals were obtained recently from the heart muscle of bonito (Katsuwonus vagans) and tunny (Thynnus alalunga). The method used for the preparation of cytochrome c was the same for both.

Crystal preparation. --Connective tissue was removed from the frozen heart, washed, minced, and the cold mince suspended without delay in an equal volume of 0.85 saturated ammonium sulfate solution containing 0.06 normal (N) ammonium hydroxide. This suspension was homogenized in a Waring blendor and allowed to stand at room temperature (20° C.) for two hours. The suspension was then filtered with Celite and the residue washed with neutralized 0.55 saturated ammonium sulfate solution. Solid ammonium sulfate was added to the mixture of the filtrate and washings, which was about 0.55 saturated with ammonium phosphate and at pH 7.2 to 7.6, until the specific gravity reached 1.230 or the sample was about 0.8 saturated. The precipitate which resulted was removed, and cytochrome c precipitated from the filtrate by adjusting the pH of the cold filtrate to 4.5 with 3 N trichloroacetic acid. The remaining ammonium sulfate solution was then removed by filtration and the precipitate of cytochrome c was compressed between filter papers and dissolved in distilled water so that the concentration of ammonium ions was below 0.05 molar.

Cytochrome c, now in solution, was adsorbed on a column of Duolite CS-101 resin or Amberlite

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 ABSTRACTER: Martin Heerdt

0.6 ANNUAL REPORT OF THE FISHERIES RESEARCH BOARD OF CANADA FOR THE YEAR 1955

Anonymous
Annual Report of the Fisheries Research Board of Canada 1955, 182 pp. (1956)

The principal work at the Halifax Station during the year was concerned with means of maintaining and assessing quality of fresh and frozen fish. This ranged from ascertaining the effectiveness of modified holds in fishing vessels to assistance in training inspectors for the Inspection and Consumer Service of the Department of Fisheries. A project for following the quality of selected fresh fish from time of processing at the coast until marketed in a 1000-mile-inland Canadian city was continued with the aid of the Department's Industrial Development Service. Appropriations from this project also assisted in large-scale experiments designed to expand animal feed uses for the residues resulting from extraction of oil from cod livers and in the construction of a machine for splitting fillets.

Further studies of alterations in the proteins of fish muscle tissue during frozen storage led to additional information about the subtle, though not necessarily deleterious, changes that sometimes occur in the flesh of fish so stored. Work on other proteinaceous materials from fish included preparation of a "fishflour" from edible flesh, and of animal feeds from cod viscera minus livers and haddock and cod offal. Board research on fish oils has to a large extent been consolidated at this station; investigation of the individual chemical constituents of Atlantic herring oil continued with the aim of developing a greater diversity of products from this oil.

At the Grand River Station increasingly greater emphasis was placed on research programs dealing with salt fish. Incorporation of an automatic device for control of relative humidity during the

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CAN VACUUM GAGE

STUDY OF DRIP LOSSES

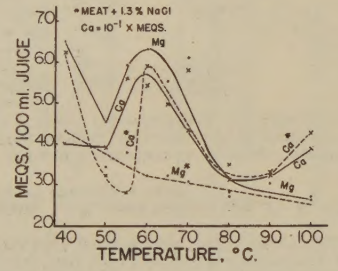
CRYSTALLINE CYTOCHROME C

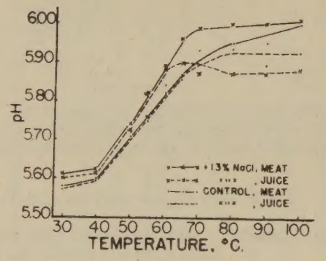
FISHERIES REPORT CANADA, 1955

0.35 (Cross Reference: 3.239)

place in beef in the temperature range 55° to 70° C. tend to promote protein hydration in such a way as to counteract the effect of denaturation. Dynamic shifts between beef and its expressed juices, which involve sodium, potassium, and calcium ions, also occur in the critical temperature range 55° to 70° C. The changes in which magnesium ions are involved, however, are not so pronounced.

Drip losses at 40° C. in unaged beef were greater in the thawed-frozen beef than in unfrozen beef, whereas the reverse was true for aged beef. Drip losses decreased with aging both in unfrozen beef and in thawed-frozen beef.





0.6

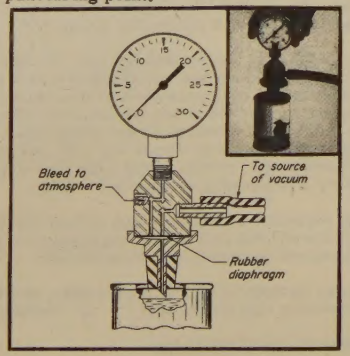
drying of salt fish allowed increased drying rates and more prolonged drying periods. Changes in the fatty constituents of the flesh during salting and drying were examined, and further studies of the conditions under which reddening occurs in stored salted cod assisted in devising means for combatting the bacteria that cause the reddening. Production of animal feeds by chemical digestion of cod offal and whole herring was investigated.

The Newfoundland Technological Unit concentrated on the engineering aspects of the various construction works and operation programs being conducted by the Department of Fisheries Industrial Development Service and the Board to meet the active interest of the industry and provincial authorities in developing the processing of dried and salted fish and other fish products, and included installation of a mechanical heading and manual splitting processing line.

The Vancouver Station furthered its work on the practicability and benefits of using refrigerated sea water instead of ice for holding fish catches at sea and at shore plants by installing tanks and conducting tests aboard a commercial fish packer vessel. This project was aided by the Department's Industrial Development Service, and included examination of the effects of such holding of the fish on their physical properties and nutritional qualities. Investigation of the useful function that antibiotics may have in retarding bacterial attack on fishery products was extended to experiments on injecting an antibiotic into freshly harpooned whales, also on its addition to shucked oysters. Experiments on incorporation of an antibiotic into ice and refrigerated sea water for holding fish continued. Types and stability of salmon flesh pigments were studied to aid in prediction of colour fading during canning, and the conditions favourable for avoidance of "curd" formation during canning also received attention. Other investigations included the growth requirements for marine fish-spoiling bacteria, the bacterial formation of vitamin B_{12}-like substances, the acceleration of fodder digestion by addition of certain fishery products to rations for ruminant farm stock, the characterization of new sterols in some shellfishes, the dietetically important sodium and potassium content of some sea foods, and the nature of the salmon-repelling susbtance evidenced by certain mammalian skin, notably human skin. Tests and consulting services relating to the growing use of synthetic fibres for fishing gear continued.

0.118 (Cross Reference: 3.338)

as compared with 5 ml. with an ordinary gage of similar capacity. Tabulated data below shows that with 202x214 size cans the error is but one-tenth of that occurring with an ordinary gage, ranging from only 1.6 inches at a 25-inch vacuum down to 0.3 inch at a 5-inch vacuum. This error decreases as the can size increases until, for the next larger can size (211x400), the error amounts to only 0.5 inch at 25 inches of vacuum down to 0.1 inch at 5 inches of vacuum. These errors are negligible in practical testing of vacuums in canned foods. Clogging with food particles is reduced in the new instrument because of the smaller amount of air drawn into it after each measurement. Furthermore, the Bourdon tube of the vacuum gage cannot clog because the diaphragm isolates it from the puncturing point.



How New Gage Improves Accuracy of Readings

Calculated errors when employing ordinary puncture-type vacuum gage (5 ml. capacity) as compared with those when using new instrument, assuming cans with normal headspace volume and atmospheric pressure of 30 in. Hg.

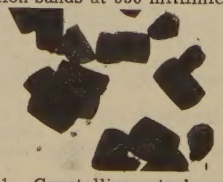
True Vacuum (In. Hg)	211x400 size can error in Hg		202-214 size can error in Hg	
	Ordinary Gage	New Gage	Ordinary Gage	New Gage
25	8.3	0.5	15.7	1.6
20	6.7	0.4	12.5	1.3
15	5.0	0.3	9.3	0.9
10	3.3	0.2	6.3	0.6
5	1.7	0.1	3.3	0.3

How New Gage Works is revealed by cutaway. Inset shows how instrument is applied to a can.

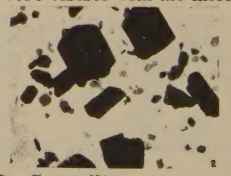
0.36

XE-64 resin, and eluted with neutralized 0.1 saturated ammonium sulfate solution. A purified and concentrated cytochrome c solution nearly saturated with ammonium sulfate was obtained. This solution was brought to about pH 9.5 with ammonia, held overnight at 2° to 5° C., filtered cold, and dialyzed to adsorb cytochrome c on a minimum amount of Amberlite XE-64. The resin with adsorbed cytochrome c was placed on a column of Amberlite XE-64, treated with sodium hypochlorite and ammonium phosphate buffer (pH 7.0 and 0.25 ammonium ion), and then chromatographed with ammonium phosphate buffer. Cytochrome c was then adsorbed from the widest band, which contained the largest amount of cytochrome c, with the aid of a small column of the resin, and recovered from this column by elution. The resulting solution contained 5 percent cytochrome c.

This solution was brought to 0.8 saturation with ammonium sulfate and to pH 8.0 to 8.5 with ammonium to which ascorbic acid had been added to completely reduce cytochrome c. The slight precipitate obtained was removed by centrifugation, and the supernatant was cooled in ice water and finally brought to slight turbidity by the addition of finely powdered ammonium sulfate. When the solution had reached room temperature, small and badly formed crystals appeared together with an amorphous precipitate. Recrystallization was carried out and a yield of crystalline cytochrome c higher than from other sources and amounting to 60 milligrams per kilogram of heart muscle was obtained. These crystals were large and strongly colored (reddish orange). Single crystals had absorption bands at 550 millimicrons (mμ) and 520 mμ and were visible with the microspectroscope.



1. Crystalline cytochrome c of Katsuwonus vagans



2. Crystalline cytochrome c of Thynnus alalunga (X 150)

0.38 EFFECT OF LOW TEMPERATURE, SODIUM NITRITE, SODIUM CHLORIDE, AND FORMALDEHYDE ON THE APYRASE SYSTEM OF THE MUSCULAR TISSUE

Partmann, Walter
Food Research 22, 51-62 (January-February 1957)

Experimental. -- The authors studied the effect of sodium nitrite, sodium chloride, and formaldehyde as inhibitors of the muscle apyrase system of white carp. Muscle fibers that had been treated with these additives were tested for contractility by the addition of ATP-salt.

Results. -- The authors learned that sodium nitrite was not a specific inhibitor of the muscle apyrase system. In the range of pH 6 to 7 the effect of sodium nitrite was independent of pH value and was subject primarily to the sodium-ion concentration. The effect of sodium chloride was similar in magnitude to the effect of sodium nitrite. The anion, obviously, also participated to a smaller degree in the inactivation of the apyrase system.

Formaldehyde gave a much stronger inhibiting effect on the apyrase system than did sodium nitrite or sodium chloride. Formaldehyde at a concentration of about 0.1 (pH 7) under the conditions studied was able to completely inactivate the muscular apyrase system. Apyrase inhibition could also be obtained with a lower concentration of formaldehyde provided the reaction time was prolonged.

Muscle fibers that had been treated with an increasing concentration of sodium nitrite, sodium chloride, or formaldehyde, first showed a sharp decline in contractility and then slowly increased until they approached a 0 value at the concentration of the additive which completely inhibited apyrase activity. The abrupt drop in contractility that occurred with formaldehyde was more distinct than the drop that occurred with sodium nitrite or sodium chloride.

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 ABSTRACTER: Martin Heerdt

0.7 MEASUREMENT OF THE NET UTILIZATION OF HEAT-PROCESSED PROTEINS BY MEANS OF THE PEPSIN DIGEST-RESIDUE (PDR) AMINO ACID INDEX

Sheffner, A. Leonard; Adachi, Richard; and Spector, Harry
Journal of Nutrition 60, 507-516 (December 10, 1956)

The nutritional value of a protein is dependent primarily on its constituent amino acids. In recent years the development of amino acid assays has resulted in in vitro procedures to measure protein quality. The values, however, often did not agree with results of animal assays. In addition, heat processing altered the biological value of many proteins without destroying amino acids. Sheffner et al. [Federation Proceedings, vol. 14, p. 279 (1955) and Journal of Nutrition, vol. 60, p. 105 (1956)] developed an in vitro estimation of the net utilization of protein known as the Pepsin-Digest Residue (PDR) index. The index integrated the amino acid pattern released by in vitro pepsin digestion with the amino acid pattern of the protein residue. This paper reported that PDR index measured changes in net protein utilization that occur during heat processing and storage.

The effect of heat treatment on PDR index and net utilization as determined by the Mitchell method of nitrogen balance in rats is given in table 1. The PDR index and net utilization value of raw and heated soybean meals are given in table 2 (see over).

Rat assays indicated that raw soybean meal had a lower net protein utilization value than the steamed soybean meal. Studies indicated that anti-tryptic factors of raw soybean meal did not significantly influence the biological value of the raw protein. Probably a toxic factor(s) that is sensitive to heat is present.

The biological value of protein is significantly reduced in heat-processed foods. The net

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 ABSTRACTER: Neva L. Karrick

0.7 THE PROTEIN REQUIREMENTS OF ANIMALS INCLUDING MAN

Block, Richard J.
Borden's Review of Nutrition Research 17, 75-96 (November-December 1956)

Introduction. -- A continuous turnover of protein occurs in the living animal. This means that the proteins of the living cell are being broken down by wear continuously; and new proteins are being reconstructed in part from amino acids recovered from the hydrolysis of previous tissue proteins, especially those that are recovered in the gastrointestinal tract, and in part from the amino acids of the diet. Tissue breakdown and regeneration results in the irreversible destruction of some of the amino acids, the extent of which is indicated by the quantity of nitrogen in the urine. The amino acids so destroyed must be replaced by the dietary proteins or be synthesized in the body from certain other nitrogen-containing compounds including ammonia, glutamine, and other amino acids, as well as from non-nitrogenous substances.

In the event of a lack of amino acids in the food supply, catabolism occurs and reduces the amino acid supply of the body which in turn decreases the quantity of tissue proteins. If the quantity of tissue proteins of an animal is large, the supply of tissue amino acids available for energy and for maintenance of essential functions is large. This tissue protein storehouse is an important factor during periods of metabolic stress. The catabolism of amino acids to form urea and other waste products is continuous, with the amount being high when the protein stores and metabolic activity are high, and low when the stores and activity are low. An accumulation of evidence is available to indicate that high protein stores combined with high catabolic activity provide energy and reserves to meet the stresses and strains of living.

Protein requirements for growth and repletion. -- Amino acids may be classified as those that are essential or indispensable, those that are semi-indispensable, and those that are non-essential or

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 ABSTRACTER: Martin Heerdt

2.05 A REVIEW OF FOOD POISONING CAUSED BY FISH AND FISHERY PRODUCTS

Shewan, J. M. and Liston, J.
J. appl. Bact., 18, 522-534 (1955)
Food Science Abstracts 28, 462-463 (October 1956)

In England and Wales, fresh fish is rarely responsible for cases of food poisoning. Of 24 outbreaks of poisoning caused by fish in 1953 (out of a total of 310 outbreaks of food poisoning), 14 were due to processed products such as fish cakes and pastes, jellied eels, and soused herrings, 7 to canned fish, and 2 to shellfish. The natural microflora of fresh fish does not include food poisoning pathogens, and the temperature at which fish is held is usually too low for them to multiply. Fish caught in polluted (mainly fresh and estuarine) waters may be carrying pathogens. In Germany, fish, mainly in a processed form, causes a larger number of cases of food poisoning than other type of food-stuff, no doubt because of the prevalent consumption of uncooked fish products, depending on vinegar, salt, and sometimes a preservative, to secure a shelf life of a few weeks only.

Botulism caused by uncooked fish products is not uncommon in Germany (23 cases in the years 1947-1952) and Russia, where Clostridium botulinum type E is almost always responsible. Type E grows and forms toxin at lower temperatures than types A to D; in only one of the known cases of food poisoning caused by type E was the vehicle of infection not fish. An allergic type of poisoning caused by the consumption of spoiled fish of the mackerel-tunny group is possibly due to histamine and/or other allied chemical substances. Certain fish are poisonous when fresh; these are listed, with details of the type of poisoning, and part of the fish responsible (flesh, liver, roe). Fish may be more poisonous, or only poisonous, when spawning. In some cases, the poisonous substance has been traced to the food of the fish, e.g. the neurotoxin present in shellfish at certain seasons in the United States and Canada is derived from a dinoflagellate in their diet.

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APYRASE SYSTEM OF MUSCLE

PROTEIN REQUIREMENTS

PDR AMINO ACID INDEX

FOOD POISONING FROM FISH, A RARITY

0.7 (Cross Reference: 6.195)

dispensable. The essential amino acids are histidine, lysine, tryptophan, phenylalanine, methionine, threonine, leucine, isoleucine, and valine. (Tyrosine will spare but not completely replace phenylalanine. Cystine will spare but not completely replace methionine. Nicotinic acid will spare but not completely replace tryptophan.) The semi-indispensable amino acids are arginine, tyrosine, cystine, glycine, and serine. (Arginine and glycine are essential for chicks and turkeys. Serine will spare or replace glycine.) The non-essential or dispensable amino acids are glutamic acid, aspartic acid, alanine, proline, and hydroxyproline.

The absolute quantities of these essential amino acids that are required in the animal diet will vary with the species of animal, with the physiological state of the animal, and with various groups within the same species. If an animal is depositing new proteins in its own body or supplying protein to a parasite organism, its protein or essential amino acid requirements are higher than if the animal is simply supplying its daily metabolic deficit.

Protein requirement from studies on nitrogen balance. -- Maintenance protein requirements are usually determined by the difference between the nitrogen taken in and the nitrogen excreted by an animal. If the amount of nitrogen taken in is smaller than the amount of nitrogen excreted, the animal is gaining protein and is in positive balance. If the opposite situation prevails, the animal is losing protein and is in negative balance. If the amount of nitrogen taken in equals the amount that is excreted, the animal is in protein equilibrium. At all times, the amount of dietary protein needed to maintain nitrogen equilibrium is influenced by the dietary history of the animal. Potential anabolic activity appears to increase as the animal is depleted of its protein stores. In the animal body, some proteins will influence the filling of one store more than another.

Protein requirements based upon the analysis of the carcass for amino acids. -- A naive approach to the study of the amino acid pattern required by an animal is to analyze it for its amino acid composition. The author used this approach over 10 years ago by analyzing entire rats aged 2, 23, 100, and 548 days. The conclusions of the author as well as other investigators was that carcass analyses are not too different from experimentally estimated results. Better evidence of the amino acid requirement pattern of an animal, quite possibly, may be obtained from an analysis of the contents of the gastrointestinal tract.

2.05

0.38

Cross-striated muscular tissue of beef and fresh-water fish had an apyrase system that was extraordinarily stable against influences such as low-temperature, autolysis, and microbial activity. Storage for 30 to 45 days at -3.5° C. caused a decrease in the apyrase activity of muscle brei from fresh-water fish.

Disorganization of the fine structure of muscle fibers is correlated with the loss of contractility and the decrease of apyrase activity. Therefore, the loss of contractility can be used as a test for the inhibitive effect of food additives on the apyrase system.

0.7 (Cross Reference: 2.9)

utilization value, therefore, rather than biological value should be measured for practical nutritional considerations. The PDR index measures the net utilization of proteins directly, and is a useful method to estimate the nutritional quality of both natural and processed proteins.

Table 1
The effect of heat treatment upon the PDR index and net utilization of casein

Treatment	PDR Index	Net Utilization
None	68	82
Oven, 350° F., 40 min.	60	
Oven, 350° F., 1 hr.	39	44
Oven, 350° F., 5 hrs.	23	24
Autoclave, 250° F., 30 min.	71	
Autoclave, 250° F., 20 hrs.	66	

Table 2
The effect of heat treatment upon the PDR index and net protein utilization of soybean meal

Treatment	PDR Index	Net Utilization
Raw	70	58
Steamed, 212° F., 30 min.	69	69
Autoclave, 250° F., 8 hrs.	44	47
Low temp. solvent extracted	65	63
Low temp. solvent extracted, steamed, 212° F., 30 min.	70	..
Low temp. solvent extracted, autoclaved, 250° F., 8 hrs.	42	..

1.85 VITAMIN CONTENT OF FRESH, PROCESSED SHRIMP

Novak, A. F.; Fieger, E. A.; and Bailey, M. E. (Louisiana State University, Baton Rouge)
Quick Frozen Foods 18, 64-65 (July 1956)

This investigation was designed to show comparative vitamin values for freshly caught, ice stored, and frozen shrimp. Riboflavin, thiamine, niacin, pyridoxine, and pantothenic acid were determined on the following products of known history: (1) freshly caught size graded shrimp; (2) experimentally iced shrimp stored for studies of quality tests; (3) freshly caught, frozen, and stored for definite time periods; (4) frozen shrimp that had been collected for quality tests by professional members of the fishing industry; and (5) fresh and frozen samples purchased from retail seafood and grocery stores in New Orleans and Baton Rouge, Louisiana.

Microbiological procedures were employed for assays of riboflavin, thiamine, niacin, pyridoxine and pantothenic acid.

Discussion of results. -- The vitamin content of fresh, iced, and frozen shrimp varies considerably. Vitamin losses were shown to occur both in ice-stored and frozen-stored shrimp. A comparison of data (table 1 and 2, see over) shows a more rapid decline in the iced than in the frozen product.

Early losses in vitamin content may occur because of insufficient refrigeration from the time the shrimp are caught until they are processed and frozen.

Organoleptic studies indicated a rapid decline in the quality of shrimp stored in ice during a two-week period. Determinations of vitamins were discontinued when low scores were obtained for organoleptic measurements because the product was then considered to be unmarketable.

See tables, over.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

2.00 DEVELOPMENT OF "HONEYCOMBING" IN HAWAIIAN SKIPJACK TUNA

Otsu, Tamio (Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service, Honolulu, T. H.)
Commercial Fisheries Review 19, 1-8 (January 1957)

The skipjack tuna (Katsuwonus pelamis) industry of the Hawaiian Islands is troubled from time to time with honeycombing, a pitted and cellular condition that appears in some of the fish during precooking and renders the meat unsuitable for canning. During 1956 about 58,000 pounds of skipjack were so affected.

Incidental to regularly scheduled biological studies, several experiments were conducted to ascertain whether degree of sexual maturity, size of fish, or type and intensity of refrigeration are related to the appearance of honeycombing during precooking.

The term "honeycombing" is applied to the meat of cooked fish which is pitted and cellular in appearance. There are various degrees of honeycombing; in some cases a slight trace may appear in the region of the nape, whereas in others the condition may be found throughout the entire body of the fish. During the course of these experiments it was observed that honeycombing starts at the nape and works posteriorly towards the caudal region. There were also some indications that it begins in the interior of the fish near the backbone and progresses outward.

Sexual maturity. -- A comparison was made between the degree of ova maturity of 131 female skipjack and the amount of honeycombing that appeared. No gross differences were detected between the ovaries of honeycombed and normal fish. This experiment indicated no relationship between honeycombing and the sexual state of the fish.

Refrigeration. -- Experiments designed to test the effect of refrigeration on the development of

(over)

 ABSTRACTER: Kathryn L. Osterhaug

2.00 CHEMICAL COMPOUNDS FORMED DURING THE SPOILAGE OF FISH

Miyauchi, David T. and Malins, Donald C. (Fishery Technological Laboratory, Seattle, Washington)
Commercial Fisheries Review 19, 26-29 (January 1957)

A knowledge of why different types of spoilage occur under various handling conditions and of what types of chemical compounds are formed would be of great value in preservation studies and in the development of objective tests for determining the freshness of fish. To gain this knowledge, investigators at the Seattle Fishery Technological Laboratory of the U. S. Fish and Wildlife Service have begun a study of the various types of chemical compounds formed in fish flesh during spoilage.

Work to date has included a preliminary investigation of protein-breakdown products such as amino acids and amines. Qualitative and semi-quantitative determinations of these substances have been made by filter-paper chromatography.

In paper chromatography, a small drop of the solution containing the substances to be separated is applied to a strip or a sheet of filter paper at a short distance from one end of the paper. The drop is allowed to dry and the end of the paper nearest the spot is placed in the "developing" solvent, which usually is water containing an organic solvent. The developing solvent travels by capillary action past the spot and up the length of the paper. Because the various components of the original spot have different rates of flow in the solvent, they are separated and may be identified by the position, shape, and color of the spots that form subsequently.

Pacific cod (Gadus macrocephalus) was chosen for these studies because it is available in considerable quantity throughout the year in Seattle. The cod were stored in two different forms: whole fish and ground fish muscle.

Experimental procedure. -- The reaction of ninhydrin with amine-containing compounds, such as amino acids and amines, to give distinctively colored compounds, was used as the basis for studying protein-breakdown products during fish spoilage. In the present work, the free amino acids and other

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 ABSTRACTER: Kathryn L. Osterhaug

2.1473 THE BONAVISTA LONGLINING EXPERIMENT, 1950-1953

Templeman, Wilfred and Fleming, A. M. (Fisheries Research Board of Canada Biological Station, St. John's, Newfoundland)
Bulletin No. 109 (1956) (Ottawa)

Longlining experiments were carried on from 1950-1953 at Bonavista, using Cape Island-type longliners from Nova Scotia. These boats were larger than those typically used in the trap, handlines and inshore linetrawl fishery on the east coast of Newfoundland.

In 1950 the operations were wide-ranging and exploratory. From June to August catches of cod by the experimental boats were extremely low close to shore, and in depths less than 100 fathoms; but 18 to 20 nautical miles to the eastward of Cape Bonavista, in the deep water, excellent new cod-fishing grounds were discovered, which yielded large catches. In the autumn the inshore grounds 5 to 8 nautical miles from land were fished successfully, though the catches were not as high as from the offshore fishing.

In 1951, from early June to mid-December, a commercial fishing trial was carried out to compare the financial returns from a 42-foot boat with a 3-man crew, and a 51-foot boat with a 4-man crew. The catch of the smaller boat was 398,000 pounds of marketable fish valued at $9,600 and the crew received $1,800 per man. The catch of the larger boat for the same period was at the rate of 500,000 pounds valued at $11,900 and each man's share was $1,800.

In 1953, two 55-foot longliners fished the offshore grounds in May. Their excellent catches, amounting to 1,300 lb. of cod per 12-line tub (600 hooks), demonstrated that longlining on a commercial basis could be successful throughout May and probably in April.

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 Author's summary

VITAMINS IN SHRIMP

FISH SPOILAGE CHEMISTRY

CAUSE OF "HONEYCOMBING"

LONGLINING EXPERIMENT

2.00 (Cross Reference: 7.593)

ninhydrin-reactive substances in cod muscle were studied by two-dimensional paper chromatography to determine what changes in the ninhydrin-reactive substances occur as the muscle deteriorates during refrigerated storage.

Two groups of fish were studied. The first group (lot 1) consisted of Pacific cod that had been stored aboard the vessel in the round in ice for 4 or 5 days. The second group (lot 2) was not iced, but was stored for 2 days aboard the vessel on top of the other iced fish. This was not a planned variation and is mentioned only to supply a complete history of the samples.

In the analysis of the samples for free amino acids and other ninhydrin-reactive substances, the aqueous fraction was extracted from cod muscle by the method outlined by Block, Durrum, and Zweig (1955). The ninhydrin-reactive constituents of the extract were separated by two-dimensional paper chromatography.

Results. -- The data obtained with lot 1 indicated the following: (1) free lysine, valine, leucines, glutamic acid, glycine, taurine, proline, and alpha- and beta-alanine were present in the fresh samples; (2) no changes were detected in the amount of glutamic acid, glycine, taurine, proline, and alpha-and beta-alanine during storage; (3) the amounts of valine and of leucines decreased in the ground samples stored in jars at 34° F., but not in the whole fish stored in ice; and (4) the amount of lysine decreased both in the ground sample stored at 34° F. and in the whole fish stored in ice.

The results obtained with lot 2 were in essential agreement with those obtained in lot 1, except that the amounts of valine and of leucines decreased only in the ground samples stored for 6 days.

Except for the amino acids already mentioned, no other ninhydrin-reactive compounds were found by the experimental procedure used.

2.1473

Bonavista fishermen, stimulated by the successful fishing of the experimental longliners, began longlining either in converted boats or ones expressly built for longline fishing. From three boats in 1951 the local fleet increased to 10 during 1952 and to 14 in 1953. Though there was considerable variation in the yearly total catch from longline boats fishing mainly offshore, the yearly catch per unit of gear showed little variation from boat to boat, and those which fished 50 to 60 trips (50 to 60 days fishing) were financially successful.

During June and July, when landings of cod from traps, handlines and linetrawls are at their peak, the proportion of the total catch attributable to longliners is small. Following this, the longliner proportion of the catch increases with advance of the season until toward the end longliners are landing the bulk of the cod. In many years longline boats could fish the deep water profitably in May and early June, and sometimes in April, while the large inshore codfishery by other methods usually begins late in June.

It is apparent that the largest concentrations of cod in the deep water are close to the 0° C. (32° F.) junction between the cold intermediate water and the warmer bottom water. The best fishing, which is probably on the warmer deepwater side of the 0° C. (32° F.) line, can be about 20 fathoms shallower or deeper and several nautical miles further inshore or offshore in different years, depending on the amount of cold water present. Because of this, it is important to take bottom temperatures to locate the junction area, particularly at the beginning of the season.

In the longline fishing, squid proved to be a highly superior bait to frozen herring and fresh or frozen capelin, catching from 50-100% more fish than these other baits.

The average gutted and gilled weight of a thousand fish from trap, handline, inshore linetrawl and offshore longline was about 2,900; 3,700; 4,600; and 6,600 pounds respectively.

1.85 (Cross Reference: 2.9)

Table 1. Vitamin Content of Frozen Shrimp

Age (Days stored)	Product No.	Micrograms/gram Thiamine	Riboflavin	Niacin	Pantothenic Acid
0	1	0.22	0.39	31.0	3.4
	2	0.25	0.40	29.8	3.8
30	1	0.20	0.38	32.0	3.1
	2	0.22	0.38	28.0	3.8
60	1	0.19	0.36	30.5	3.2
	2	0.20	0.38	30.1	3.5
90	1	0.16	0.34	29.5	3.0
	2	0.18	0.34	31.5	3.3

Table 4. Vitamin Content of Ice-Stored Shrimp

Age (Days stored in ice)	Date of Catch	Micrograms/gram Thiamine	Riboflavin	Niacin	Pantothenic Acid	Pyridoxine
0	Dec. 1, 54	0.51	0.35	. . .	. . .	0.57
	Apr. 2, 55	0.38	0.40	53.0	3.70	0.37
	July 3, 55	0.26	0.43	44.5	2.70	0.41
11	Dec. 1, 54	0.45	0.33	. . .	. . .	0.40
	Apr. 2, 55	0.22	0.33	45.0	2.80	0.19
	July 3, 55	0.18	0.35	40.0	2.30	0.27

2.00 (Cross Reference: 1.125)

honeycombing followed this general pattern: (1) a group of skipjack were taken from a school by live-bait fishing; (2) a portion of the group were frozen within an hour or two and used as controls; and (3) the remainder received various experimental treatments prior to freezing. The experimental variations included storage in crushed ice and storage in sea water for various lengths of time.

The results of these experiments indicate that honeycombing develops in Hawaiian skipjack held without refrigeration, independent of sexual maturity or size of fish. It appears that honeycombing is more rapid at higher seawater temperatures.

Although a relationship has been shown between lag in refrigeration and honeycombing, the basic cause of the condition has not been determined. Further experiments are necessary before precise methods of eliminating or reducing the condition can be prescribed.

2.01 REDUCTION OF TRIMETHYLAMINE OXIDE BY BACTERIA
I. THE ENTEROBACTERIACEAE

Wood, A. J. and Baird, Elizabeth A. (Atlantic Fisheries Experimental Station)
Journal of the Fisheries Research Board of Canada 6, 194-201 (August 1943)

The ability to produce trimethylamine from trimethylamine oxide is a characteristic of all the tribes of the family Enterobacteriaceae.

Cultures of Enterobacteriaceae were obtained from a number of different laboratories and were maintained as stock cultures on nutrient agar slides.

The trimethylamine oxide was synthesized by the procedure of Dunstan and Goulding (1899), and was recrystallized from alcohol twice before use.

The medium used for the determination of ability to reduce trimethylamine oxide consisted of the following: trimethylamine oxide, 0.1; glucose, 0.25; bacto-peptone, 0.5; sodium chloride, 0.5; magnesium sulfate, 0.1; and di-potassium phosphate, 0.1; pH adjusted to 7.2 before autoclaving. This medium was found to be suitable for the growth of all cultures used in the study.

The procedure used, as outlined below, depends upon the ready volatility of the trimethylamine (B.P. 3.5° C.) at 45° C. in an alkaline medium.

To the culture tube at the end of incubation: (1) add 1.5 ml. 40 percent formaldehyde. Shake and let stand 3 minutes; (2) add 3 ml. of saturated potassium carbonate. Close the tube immediately with a one-hole rubber stopper that has been fitted with a short glass tube (5 mm. wide by 4 cm. long), slightly constricted at the lower end, and containing a small piece of absorbent cotton that has been impregnated with bromthymol blue adjusted to pH 4.0 with 0.1 N sulfuric acid. Incubate the tubes in a water bath at 45° C. for 30 minutes. If trimethylamine is present in the culture, it will distill from the broth, condense in the cotton, and cause a shift in the indicator color to the alkaline side. The function of the formaldehyde is to bind any ammonia that may be present.

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 ABSTRACTER: Kathryn L. Osterhaug

2.1122 TROLLING GEAR IN CALIFORNIA

Scofield, W. L. (Marine Fisheries Branch, California Department of Fish and Game)
Fish Bulletin No. 103, State of California, Department of Fish and Game, Marine Fisheries Branch (1956)

Trolling can be conducted from small boats that require a comparatively low original investment and uses relatively inexpensive gear when compared with netting operations. For these reasons, hundreds of commercial fishermen have been attracted to this method of fishing along the California coast.

The leading species of fish caught by trolling are:

King salmon Quinnat Chinook Sacramento Spring Tyee	Oncorhynchus tshawytscha
Silver salmon Coho Blueback	Oncorhynchus kisutch
Pink salmon Humpback	Oncorhynchus gorbuscha

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 ABSTRACTER: Kathryn L. Osterhaug

2.111 ROPES PRESERVED BY ORGANOTIN COMPOUNDS

Britton, S. C. (The Tin Research Institute, Greenford, Middlesex, England)
Tin and Its Uses, No. 38, 6-7 (Spring 1957) (Middlesex, England)

Purpose. -- The preservative action of organotin compounds upon manila and sisal ropes immersed in sea water was tested recently by the Tin Research Institute. Untreated samples of rope were compared with treated samples of rope impregnated with one of the following solutions: (1) commercial preservative A, (2) commercial preservative B, (3) triethyltin hydroxide, and (4) tributyltin acetate.

Experimental. --Triethyltin hydroxide was prepared for use as a 0.5 percent solution in water, whereas tributyltin acetate was prepared for use as a 0.5 percent solution in acetone. Sample ropes to be treated were immersed in a cold solution of the preservative compound. After treatment, each sample rope (36 inches in length) was put through a steel bar having holes 14 inches apart, by threading each end of the rope through a separate $\frac{3}{4}$-inch hole and tying a knot to form a loop. Each of the loops was layed free from other loops in sea water 12 inches below the surface, but supported in part by the wooden framework of a raft on which the steel bars were supported. Tests were begun in April 1954 and ended in October 1955.

Results. -- The strength of each of the rope samples after it had been in sea water for 18 months was measured as follows: (1) as each rope was withdrawn from the steel bar, (2) as each rope was pulled with the hands immediately after it was withdrawn, and (3) as each rope was pulled with the hands after it had been allowed to dry for 24 hours at 60° F. The results are tabulated (see over).

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 ABSTRACTER: Martin Heerdt

2.2 SUCTION HOSE FISH PUMP

Anonymous
Food Manufacture 32, 77 (February 1, 1957)

A California corporation has recently developed rubber suction and handling equipment for unloading and transferring freshly caught fish from a boat to a conveyor and from there into the cannery.

Known as the Kimmerle fish pump, the new equipment is capable of passing fish out of the suction system in such a manner as to prevent the fish from ever reaching the "source of suction" which would mangle the fish.

The new units are being used by many large canneries in the United States to unload sardines, mackerel, etc., from the boat; they are also being used to handle and transfer live bait from net to receiving tank with no damage to the fish. It is claimed that the live fish is in better condition after being moved with this equipment than if moved by hand.

See illustration, over.

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PRODUCTION OF TRIMETHYLAMINE

ROPE PRESERVATIVES

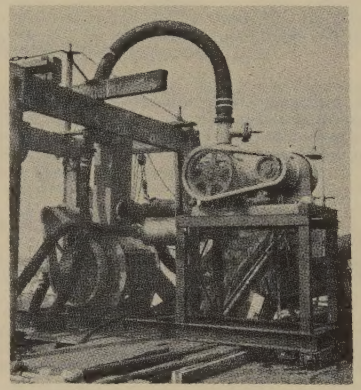
TROLLING GEAR

FISH PUMP

2.111

Treatment	Total Number of Samples	Broken during Withdrawal	Broken by First Pull after Removal	Broken by Second Pull after Removal	Unbroken in all Tests
SISAL ROPE					
None	3	3	—	—	Nil
Commercial A ..	5	3	2	—	Nil
Commercial B ..	4	3	Nil	1	Nil
Triethyltin hydroxide	2	Nil	Nil	Nil	2
Tributyltin acetate	2	Nil	Nil	2	Nil
MANILLA ROPE					
None	4	4	—	—	Nil
Triethyltin hydroxide	3	Nil	Nil	3	Nil
Tributyltin acetate	3	Nil	Nil	3	Nil

2.2



2.01 (Cross References: 0.5, 7.81)

Preliminary tests indicated that an incubation period of from 4 to 14 days is adequate for the genera of bacteria used. In the experiments here recorded, an incubation period of 8 days was used. The cultures were grown at the generally accepted optimum temperature for each genus.

Some 650 cultures, representing most of the genera and species of the family Enterobacteriaceae, were tested for their ability to reduce trimethylamine oxide. The species of the tribe Eschericheae that have been studied and the total number of cultures of each that were tested are listed below:

Escherichia coli	102	Aerobacter aerogenes (intermediate)*	17
" coli (intermediate)*	85	Klebsiella ozaenae	1
Aerobacter aerogenes	103		

*Slow lactose fermenting types.

All species of this tribe proved capable of reducing trimethylamine oxide to trimethylamine. Apparently this ability is a characteristic of the tribe Eschericheae.

Likewise, all of the species of the tribe Proteae that were tested were able to produce trimethylamine. They were as follows:

Proteus vulgaris	23	Proteus ichthyosmius	6
" mirabilis	12	" "A" strains*	5
" morganii	12	" "Cope"†	11
" hydrophilus	5	" unidentified	1

*Stuart et al. (1943) †Cope and Kilander (1942).

Considering the tribe Salmonelleae as a whole, it has been found that trimethylamine production may be considered a tribal property. Of the forty-eight cultures of Salmonella tested, all gave positive results for trimethylamine production as did the sixteen cultures representing the type species of the genus Eberthella.

The genus Shigella provided an exception to the general findings of the production of trimethylamine from its oxide by the family Enterobacteriaceae. S. dysenteriae and S. paradysenteriae failed to activate trimethylamine oxide, whereas the other representatives of the groups are able to produce trimethylamine.

The genus Erwinia also contains species that are unable to reduce trimethylamine oxide.

2.1122 (Cross Reference: 1.0114, 1.21, 1.31)

Albacore	Thunnus germo
Barracuda	Sphyraena argentea
White sea bass	Cynoscion nobilis
Bonito	Sarda chiliensis
Yellowtail	Seriola dorsalis
Yellowfin tuna	Neothunnus macropterus

Upon casual observation one sees little difference in the operation of trolling gear. There are, however, a few important differences in the methods of trolling for salmon and albacore. The following summary points out these differences:

	Salmon	Albacore
Trolling speed	1 to 3 knots	Average 6 knots
Bow poles used	Occasionally	Rarely
Average number pole lines per boat	6	8
Number stern lines per boat	1 or 2	2 to 5
Average total lines per boat	7	11
Average lures per line	4	1
Catches made	Deep	Near the surface
Sinkers used	Commonly	Occasionally
Weight of sinkers	Heavy	Very light
Catches made in wake of boat	Seldom	Frequently
Lines pulled by	Gurdy	Hand

2.113 MAGNESIUM ANODES TO PROTECT A STEEL HULL

Anonymous
Southern Fisherman 17, 50, 61 (February 1957)

What can be done to protect a steel hull from excessive corrosion loss?

Underwater deterioration is largely traceable to a chemical-electrical reaction called galvanic action, which is the corrosive force that arises between different areas of the same piece of metal, between different metals and, occasionally, between metals and other substances. These metal areas have different electrical potentials and when they are connected by an electrolyte such as salt water, an electrical circuit is formed. The result is, in effect, a battery in which the most active portion of the metal deteriorates.

Paint can be used to slow down this action but no known paint film is perfect enough to prevent it. Theoretically, it is possible to completely prevent all underwater corrosion by cathodic protection, but the expense would be exorbitant. The most practical solution is to apply a good paint film and then help it work by applying anodes to the hull to combat anodic action.

The largest single galvanic cell encountered on a steel-hulled vessel is that formed between the steel hull, steel rudder and shoe, and the bronze propeller.

Zinc plates are often used as the anode for providing galvanic protection. A limitation in the use of zinc is that the surface of the plates often become covered with a whitish-gray deposit that materially lessens their effectiveness.

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 ABSTRACTER: Kathryn L. Osterhaug

2.12 PRELIMINARY RESULTS OF DEEP-WATER EXPLORATION FOR SHRIMP IN THE GULF OF MEXICO BY THE M/V OREGON, 1950-1956

Bullis, Harvey R., Jr. (Exploratory Fishing and Gear Development Section, U. S. Fish and Wildlife Service, Pascagoula, Mississippi)
Commercial Fisheries Review 18, 1-12 (December 1956)

The first catches of deep-water royal-red shrimp (Hymenopenaeus robustus) were taken in July 1950 by the M/V Oregon, while making a series of trawling stations off the Mississippi Delta, in increasing depth intervals (195 to 232 fathoms) beyond the continental shelf. By the end of 1954 exploratory coverage of the 100 to 300 fathom range in the eastern Gulf between Mississippi Delta and Key West plus the Texas Coast was extensive, with limited work carried out to depths of 500 fathoms. Royal-red shrimp was found on all types of bottom throughout the Gulf of Mexico in depth ranges of 190 to 270 fathoms, with a maximum range of 150 to 400 fathoms. In March, 1955 the Oregon made a series of 34 trawling stations using commercial scale gear to determine the commercial potentialities of the shrimp in depths of 160 to 220 fathoms between Mississippi Delta and Cape San Blas, Florida. In July, round-the-clock trawling was attempted in depths 190 to 300 fathoms, south and southeast of Dry Tortugas; extensive gear damage caused the work to be stopped ahead of schedule. During September, exploratory coverage was extended along the Louisiana Coast, where generally poor trawling bottom was encountered.

In March, 1956, further commercial-fishing trials were run off the Mississippi and Alabama coasts. In May, three weeks were spent trawling along the Mississippi, Louisiana, and Texas coasts. In June, the two restricted areas off Mobile and Dry Tortugas were fished round-the-clock for three days in each area. Based on previous results, these two areas appeared the most promising for immediate exploitation. To date, 308 trawling stations have been made by the Oregon between the 100

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 ABSTRACTER: Harold C. Johnson

2.12 SOME PROBLEMS IN MID-WATER TRAWLING

Richardson, I. D. (Fisheries Laboratory, Lowestoft, England)
World Fishing 6, 28-31 (February 1957)

The definition of a mid-water trawl as covered in this report is that the trawl is at all times clear of the sea-bed and no part of it touches the sea-bed, nor is the sea-bed used as an adjunct to the net as in the ordinary demersal trawl or seine.

Mid-water trawls are usually square-mouthed nets produced by constructing the net of four panels of similar size. Occasionally the side panels are smaller than the upper and lower panels. These panels taper to a long cod-end which may be tubular and made of only two panels at its extremity.

This square-mouthed structure is necessitated by the concept that, if the sea-bed is not used as part of the net, and it is not known in what direction the fish might swim to avoid the net, the chances of escape must be avoided equally in all directions. It has been suggested that the lower panel should be extended forward in front of the net to prevent fish escaping below the footline. One effective method of preventing fish from escaping the net is to tow fast.

The strength of the net is determined by two factors, (1) the material from which the net is constructed, and (2) the size of the mesh. The smaller the mesh size the stronger the lint, but the resistance of the net as a whole is greater due to poor filtration. The mesh must, therefore, be as large as possible. The usual practice is to make the cod-end and the lengthening pieces of the net of small enough mesh to retain the fish without meshing and the rest of the net of large mesh. A mesh size of up to 6-inch mesh (3-inch bar) may be used in the fore part of the net where it is thought that the fish are sufficiently scared by the lint to prevent any attempt to escape through the large mesh. Between the

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 ABSTRACTER: Kathryn L. Osterhaug

2.3 FISH HYGIENE AND SANITATION

Anonymous
Food Manufacture 31, 530 (December 1, 1956)

Very few cases of food poisoning in Britain are due to fish, according to Mr. R. Spencer of the Department of Scientific and Industrial Research, in a paper presented to the Public Works and Municipal Services Congress held in London recently. He said that fish was one of the safest foods and that statistics for England and Wales during the past few years, showed that "fresh, unprocessed fish was hardly ever involved in food poisoning."

Nevertheless he stressed that the conditions under which fish are handled and processed make hygiene (the prevention of contamination by harmful bacteria) and sanitation (the maintaining of clean surroundings and clean handling conditions) very important.

Fish when first caught do not, usually contain any bacteria likely to endanger health. They do, however, contain many types of bacteria which can flourish on the flesh and make it sour or stale. The aim of hygienic and sanitary measures is to keep the numbers of these bacteria to a minimum and to prevent contamination of the fish by other bacteria which might be harmful to the health of the consumer.

Many bacteria can flourish at freezing point, the temperature at which it is customary to store fish before it is eaten or processed. So it is important to keep possible contamination to a minimum during the handling and storage.

Contamination can take place aboard trawlers during the handling, cleaning and storage of fish.

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CATHODIC HULL PROTECTION

MID-WATER TRAWLING

DEEP-WATER SHRIMP EXPLORATION

FISH SANITATION

2.12 (Cross Reference: 2.1121)

6-inch mesh and the small cod-end mesh the mesh size is gradually reduced.

The strength of the material from which the net is made must be great enough to allow the net to withstand being towed at maximum speed and maximum water resistance. Cotton was found to be unsatisfactory at speeds exceeding 3 knots, and even below this speed the drag of the net caused constant ripping whenever sudden variations in towing speed were made. Speed of towing, especially in an experimental fishery, must be as high as possible and for this the net must be as strong as possible. Nylon or perlon seems to be the obvious answer as sisal and manila are too thick for the additional strength that they provide.

Various factors operate to cause fish to avoid the trawl net. It is apparent that fish are scared by the noise from the ship's engine, particularly if it is a Diesel engine and the fish are near the surface. Some German experiments indicate that they are also frightened by warps and doors. One way of reducing this scaring effect is to tow so fast that the fish do not have time to avoid the net, and another is to reduce the scaring effect. The method of trawling in which the net is towed between two boats is the ideal answer to this problem. In this case the boat does not pass over the fish and any disturbing effect produced by the noise of the boat only scares the fish toward the net.

In summary, when beginning trials of mid-water trawls in a previously untried area, the requirements are (1) a net strongly constructed but having the maximum filtration compatible with strength; (2) the net of a size that can be towed at up to 5 knots, but large enough to prevent the possibility of too much avoidance; (3) a ship of sufficient power rigged for trawling; (4) a depth indicator and preferably a headline oscillator; (5) the warp should be light and the legs at least 30 fathoms long for a 60-foot headline trawl. An echo-sounder on the ship is essential and a horizontal scanning sounder is also useful.

2.3

Washing the fish has little effect in reducing subsequent spoilage. A major difficulty is that of keeping to a minimum bacterial contamination of fishrooms and surfaces with which the fish itself or the preserving ice come into contact. Wooden surfaces, unless painted and varnished, are likely to be heavily contaminated and practically impossible to wash really clean. Conditions in which gutting and washing are done have an important bearing on the prevention of contamination of the fish and adequate icing of the cargo is vital. In general, although the many difficulties inherent in the preparation and transportation of the fish to the home port are fully appreciated, the standards of hygiene and sanitation aboard trawlers is not entirely satisfactory.

Mr. Spencer said that the principal hazard during handling and distribution of fish is contamination during filleting and processing. The processing of fish is carried out under such a variety of conditions that it is impossible to generalize on the hygienic and sanitary measures involved. Factories range from modern ones with high standards to those in which contamination is unavoidable. Usually fish fillets intended for freezing are handled with greater care than fish to be sold as iced wet fish. The returnable wooden boxes used for the inland transport of fish are so difficult to clean efficiently between journeys that their continued use is to be deprecated.

Despite the excellent record of fish in relation to food poisoning the maintenance of high standards of cleanliness at all stages of the industry is very important. In some processes considerable improvements remain to be made.

2.113

Magnesium plates or anodes attached to the bottom of a steel hull have certain advantages. Experience has shown that magnesium, a more active metal than zinc, does not develop a corrosion deposit and continues to exert its beneficial effect until it is totally consumed. The installation of a magnesium anode on the bottom sets up, in effect, a galvanic cell with the magnesium as the anode and the steel of the hull as the cathode. Current flows between the two and the magnesium is sacrificed to protect the hull.

2.12 (Cross Reference: 1.85)

and 500 fathom curves in the Gulf of Mexico.

In each area explored, efforts were made to complete a series of trawl drags in close depth intervals. These drags were of 1 to 3 hour duration depending on the appearance of the bottom as shown by the depth recorder; however, drags of 5 or more hours are possible since accumulation of bottom trash is moderate. To fish these deep-water shrimp grounds the use of loran is imperative because the known fishing areas are bounded on both ends by bad trawling bottom much of which is not detectable by depth-recording equipment.

Royal-red shrimp catches of commercial significance have been restricted for the most part, to two well defined areas: off Dry Tortugas, and east of the Mississippi Delta. The latter covers an area of about 300 square miles, extending from 87° 30' west longitude to 88° 40' west longitude between the 190 to 270 fathom curve. Close correlation of royal-red shrimp and bottom temperatures in the Delta area have been noted and with few exceptions the shrimp appear to be confined within a temperature range of 45° to 54° which is characteristic of the 190 to 220 fathom range in both these areas. The Tortugas grounds cover an area of 120 square miles, extending from 83° 17' west longitude to 83° 4' west longitude, between the 190 to 250 fathom curves, with the distance between these curves varying from 2 to 6 miles.

Royal-red shrimp have shown no apparent seasonal variation in average size. The heads-off per pound count averaged 26 to 30, in both Tortugas and Delta areas of maximum fishing concentrations. No uniform size dominates the catch, which consists of shrimp of 12 to 50 heads-off per pound. Although the Delta and Tortugas areas contain sufficient quantities of royal-red shrimp to permit profitable exploitation throughout most of the year, the magnitude of this potential resource, in terms of continuing yield, is unknown.

3.239 THE FREEZING AND COLD STORAGE OF RAW CRAYFISH

Anderson, K. W. (The Nicholas Institute, Sherbrooke, Vic., Australia)
Food Preservation Quarterly 16, 69-71 (December 1956)

Reay (1950) and Reay and House (1951) reported that after cooking, the flesh of frozen raw crayfish (lobster) became abnormally soft and shrunken, and that it adhered to the shell. They also reported flavor inferior to that of lobsters that had been precooked prior to freezing. This was attributed in part to enzyme activity that can be destroyed by heating. Altenburg (1950) described a method of preventing the flesh from adhering to the shell. It consisted of immersing the raw lobsters briefly in boiling water before they were frozen.

The experiments reported in this paper were designed to assess the effect on the quality of the edible meat of storage for 2 to 8 weeks at 0° F. prior to cooking. Examination of the treated fish was largely organoleptic but data on weight losses during storage, cooking, and thawing were also obtained.

Experimental procedure. --Thirty live crayfish (Jasus lalandi), 1¼ to 1¾ pounds in weight, from a February catch were individually weighed, numbered, and divided into five groups of six fish each. Group I was boiled for 15 minutes in sea water, drained, and stored at 0° F. The remaining fish were frozen at 0° F. and, at successive two-week intervals, one group was thawed for 16 hours at an air temperature of 40° to 50° F., boiled in the same way as group I, and returned to storage. In this way the groups of raw crayfish received the following storage before being cooked:

Group	I	II	III	IV	V
Storage (weeks)	0	2	4	6	8

(over)

ABSTRACTER: Kathryn L. Osterhaug

3.2497 THE TIME-TEMPERATURE TOLERANCE OF FROZEN FOODS. 1. INTRODUCTION-- THE PROBLEM AND THE ATTACK

Van Arsdel, W. B. (U. S. Department of Agriculture, Albany, California)
Food Technology 11, 28-33 (January 1957)

Since 1948 the Western Utilization Research Branch of the Department of Agriculture has been engaged in an investigation to discover how frozen food products behave under the conditions of time and temperature that are encountered in the commercial distribution system. The objectives of this research include the formulation of suggestions for the improvement of raw material, processing and packaging that may become apparent upon analyses of the results.

The information needed fell into two distinct but interrelated fields of research: (1) a comprehensive survey of the temperatures and times experienced by frozen foods in the distribution system, and (2) a comprehensive determination of the behavior of commercially packed frozen foods with respect to quality changes under as wide a range of time and temperature conditions as might be encountered in the distribution system.

The time-temperature tolerance project has had the following major objective:

1. To determine how frozen food products behave under conditions of time and temperature such as they may actually experience in the commercial distribution system, and in this way to provide information comprehensive enough to enable industry to (a) settle upon and specify allowable or tolerable deviations from "ideal" distribution conditions and (b) concentrate efforts on improvement of the more critical operations or areas in the system; and the following two derivative objectives:

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ABSTRACTER: Kathryn L. Osterhaug

3.2495 EFFECTS OF ADDED SODIUM CHLORIDE, POTASSIUM CHLORIDE, CALCIUM CHLORIDE, MAGNESIUM CHLORIDE, AND CITRIC ACID ON MEAT SHRINKAGE AT 70° C. AND OF ADDED SODIUM CHLORIDE ON DRIP LOSSES AFTER FREEZING AND THAWING

Wierbicki, Eugen; Cahill, V. R.; and Deatherage, F. E. (Departments of Agricultural Biochemistry and Animal Science, Ohio State University, Columbus)
Food Technology 11, 74-76 (February 1957)

Objective. --A study was made to determine the effect of various additives on the water holding properties of ground meats and the effect of these properties on ground meat quality.

Experimental. -- The additives used were citric acid and solutions of sodium, potassium, calcium, and magnesium chloride. These solutions were added individually and in combination to the meat, and the meat was then heated to 70° C. Sodium chloride solution was also added to meat which was then frozen, allowed to thaw, and warmed to 40° C.

Results. -- Added solutions of chlorides increased the water holding capacity of the meat protein except when added in very high concentrations. Less juice was expressed from the heated meats when calcium and magnesium chlorides were added than when sodium and potassium chlorides were added. Magnesium chloride had the most pronounced effect on the water holding capacity of meat proteins, figure 1 (see over). Citric acid, in contrast, increased meat shrinkage when added to the meat before it was heated. The concentration limits of the additives from the standpoint of taste acceptability are shown in figure 1.

Combinations of the chlorides also were used to determine their effect on the water holding

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ABSTRACTER: Martin Heerdt

3.25 REFRIGERATION OF FISH - PART 5 - DISTRIBUTION AND MARKETING OF FROZEN FISHERY PRODUCTS

Slavin, Joseph W. (Fishery Technological Laboratory, East Boston, Massachusetts) and Heerdt, Martin (Fisnery Technological Laboratory, Seattle, Washington)
Fishery Leaflet No. 431, 78 pp. (October 1956) U. S. Fish and Wildlife Service, Department of the Interior, Washington 25, D. C.

Transportation of frozen fish

- Railroad
  - History
  - Silica-gel car
  - Dry-ice car
  - Split-absorption car
  - End-bunker car
  - Overhead-bunker car
  - Mechanical car
    - Problems that affected the design of mechanical cars
    - Modern low-temperature mechanical car
    - Comparisons between mechanical and salt-and-ice bunker cars
- Truck
  - Dry-ice refrigerated trucks
  - Overhead bunker
  - End bunker
  - Indirect dry-ice system
  - Mechanical refrigerated trucks
- Ship
  - High-side equipment
  - Low-side equipment
- Airplane
- Insulated containers
- Bibliography

Marketing of frozen fish

- Wholesale operation
- Transportation of frozen fish
- Retail operation
  - Effect of thawing on quality
  - Effect of storage temperature on quality

(over)

ABSTRACTER: Martin Heerdt

FREEZING RAW CRAYFISH

CHLORIDES VS. DRIP FORMATION

TIME-TEMPERATURE STUDIES

DISTRIBUTION AND MARKETING

3.2495 (Cross Reference: 3.11)

capacity of heated meat. Beef treated with a mixture of sodium and magnesium chlorides in solution also was made more tender.

Sodium chloride solution added to meat before it was frozen retarded the drip encountered when the meat was thawed. The effect of sodium chloride added to meat before it is frozen closely parallels the effect of sodium chloride added to meat before it is heated or cooked. The addition of sodium chloride decreases the amount of juice that can be expressed from the meat after it has been heated to 70° C.

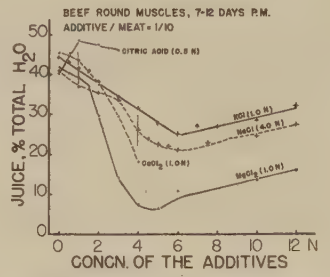

Fig. 1. Curves showing the relation between added sodium chloride, potassium chloride, calcium chloride, magnesium chloride or citric acid and the juice expressed by meat heated to 70° C. The concentrations noted in parentheses on each curve indicate the approximate limits of additives from the standpoint of taste.

3.25 (Cross Reference: 3.26)

Effect of slow turnover on quality
Control of odor transfer
Recommendations for retaining the quality of fishery products
Methods of determining quality of packaged fishery products
When consumer selects package
Appearance of package
Appearance of fish
When consumer opens package
If fish are frozen
Frost or cavity ice
Freezer burn
If fish are thawed
Color of fish
Space in the package
Rancid odors
Honeycombed texture
Drip from fish
When consumer cooks fish
Color
Texture
Flavor and odor
Literature cited

Locker plants and home freezers

Design of locker plants and home freezers
Locker plants
Processing rooms
Chill rooms
Freezers
Lockers
Cold-storage rooms
Home freezers
Household refrigerators
Household freezers
Handling of fish in lockers and home freezers
Determination of quality
Preparation for freezing
When caught
At the locker plant
Fish
Shellfish
Protection during frozen storage
Ice glaze
Moisture-vaporproof materials
Containers
Freezing fish in lockers and home freezers
Storing fish in lockers and home freezers
Thawing frozen fish and shellfish
Bibliography

3.239 (Cross Reference: 1.89)

After additional storage of from 8 to 12 weeks (chosen to represent typical trade storage practice) samples from each group were removed and thawed. The tail meat was divided into ½-inch cubes and submitted to the tasters. They assessed the samples for texture and flavor on a scale of from 0 to 5 points (large scores representing high acceptability) and also ranked them for general acceptability. A freshly cooked crayfish was used as a control in each test.

Consideration of the results of the tasting tests showed clearly that the control and Group I fish were preferred and that no preference was indicated between the remaining groups. Frozen storage of raw crayfish for two weeks at 0° F. prior to cooking yielded an inferior product.

3.2497

2. Upon the basis of the above results, to discover or devise improvements in raw material selection and handling, processing, and packaging, such that the finished products will better withstand adverse subsequent experiences.

3. To seek tests of product quality that can be applied to a frozen food at any point in the distribution system to indicate how much it has changed and, if possible, to estimate where it stands in the scale of commercial acceptability.

The second objective of this study has been to reinforce continuing advances in technology by focusing attention on specific types of product instability that still cause trouble.

The third objective has been to develop tests that can be applied to products at any point in the distribution system to assist in the control and improvement of practices.

Experimental. --The planning of specific experiments in which samples are subjected to time-temperature schedules simulating those that may be encountered in actual commercial experience involves the selection of a reasonably small number of reproducible time-temperature patterns that, as a group, will substitute acceptably for the infinite variety of actual patterns. It is not sufficient to carry samples through a temperature history simulating "average" conditions; something like half the frozen foods on our markets experience worse treatment. The planning must include variations to cover the range between "probably satisfactory conditions" and "almost certainly unsatisfactory conditions".

An important consideration in these experiments was the conclusiveness of the results. Findings based on atypical results were guarded against by repeating procurements in two or three packing seasons and by procuring from each of the major producing areas for each commodity.

3.25 NEW REFRIGERATED UNIT FOR SMALL FREIGHT SHIPMENTS

Anonymous
Industrial Refrigeration 132, 21-22, 46 (January 1957)

A new cargo unit that can be used for small refrigerated shipments was recently introduced. The new unit is a portable rectangular box mounted on a flatcar. It can be "switched", with the aid of a fork-lift truck, from flatcar to truck-hauled flatbed trailer so that a continuous trip from shipper to receiver can be made. The unit is made of reinforced plastic.

The containers are 8 feet wide and 8 feet high, and can be 8, 17, or 35 feet long. In construction they are essentially an over-sized, enclosed pallet with slots in their floors to take the forks of lift trucks. A huge fork-lift truck can quickly move the containers from the flatcar to a flat-bed truck trailer for transportation from rail terminal to destination. Anchors set into the flatcar floor fit into wedge-shaped openings in the containers bottom and prevent the load from shifting during transit.

The design of the refrigerated cargo unit incorporates a new construction concept for railroad equipment. This is the "sandwich-type" panel fabrication utilized by the aircraft industry. The single-section panel sides and roof of the 17 by 8 by 8-foot unit are made of 5¾-inch flat-grain balsa cores faced with 1/8 inch reinforced plastic skins. The floor is 2¾-inch flat-grain balsa core surfaced on the top with plywood and ¼-inch reinforced plastic, and on the bottom with the same type plastic.

Dry ice stored in a separate bunker in the front end of the cargo unit is used for refrigeration. Air from the dry ice is circulated around the produce. The temperature is thermostatically controlled.

 ABSTRACTER: Kathryn L. Osterhaug

3.26 SOME OBSERVATIONS ON RAIL TRANSPORT OF FROZEN FOODS WITH SPECIAL REFERENCE TO RISES IN TEMPERATURE DUE TO LOADING CONDITIONS

Hicks, W. E.; Smith, M. B.; and Barr, Ottley (C.S.I.R.O., Division of Food Preservation, Homebush, N.W.S. (Australia)
International Congress of Refrigeration, Reports and Communications, 9th Congress, Sec. 7, 51-57 (Paris, France, 1955)

Introduction.--In Australia, close control of temperature in frozen cargoes is most critical with frozen meat for export and with packaged quick-frozen vegetables and fruit. Most journeys with such cargoes are fairly short, less than 48 hours, and there is no great difficulty in providing cars which will maintain satisfactory average temperatures. Consequently, in most of the experiments with frozen goods, attention has been concentrated on the maximum cargo temperatures and the effect of loading conditions.

Experiments with cargoes of quick-frozen peas.--Two types of car have been studied; the 40-foot roof tank car similar to the Canadian type, and an end bunker car of similar size. Figure 1 gives typical thermocouple temperature measurements during the loading and journey.

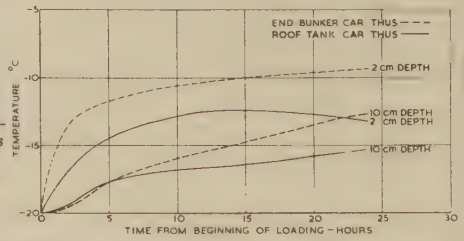

Fig. 1--Temperatures in cartons of frozen peas on the top corner of the stack against end wall--very good loading conditions.

Experiments with cargoes of frozen meat.--Studies were performed in an old type end bunker car

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 ABSTRACTER: Max Patashnik

3.3 CURRENT TECHNOLOGICAL PROBLEMS IN FISH CANNING

Hess, E. (Technology Branch, Fisheries Division, FAO, Rome, Italy)
FAO Fisheries Bulletin 9, 161-180 (October-December 1956)

The fish canning industry endeavors to produce canned food not only acceptable to the widest circle of consumers, but which may be chosen in preference to other competing protein foods. Consumer acceptance is determined by subjective organoleptic tests. The consumer judges the quality of the product by its appearance, odor, flavor, texture, and general workmanship.

The factors that influence the criteria of quality include: (1) the raw material; (2) its freshness and natural qualities; (3) the methods of handling, preparing, pretreating and packing the raw material in cans; (4) the effects on the can contents of heat sterilization and subsequent cooling; (5) the chemical interaction between container and contents; and (6) the effects of storage conditions on containers and contents during more or less prolonged storage.

Raw material.--It is self-evident that the quality of the canned product must depend primarily upon the quality of the raw material delivered to the cannery and the conditions under which it is held prior to canning, yet this is still the most important problem facing the fish canning industry.

The quality of the raw material, apart from any physical damage it may have suffered from rough handling, depends upon two main factors: (1) the natural characteristics of the flesh, which may vary with such factors as season, spawning or molting conditions, age, and fishing grounds; and (2) the freshness of the raw material which is gradually lost from the moment of death or even during the death struggle. In tuna, it has been found that the body temperature rises by almost 21° F. within 50 minutes after death.

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 ABSTRACTER: Kathryn L. Osterhaug

4.6 ANTIOXIDANTS

Ruys, M.
Rev. franc. Corps gras 3, 163-172 (1956)
Food Science Abstracts 28, 586-587 (December 1956)

Deterioration of fats may be due to: absorption by the fat of foreign odours; absorption of volatile substances produced on the surface of the fat by oxidation; hydrolytic production of free fatty acids by lipases (of micro-organisms, flour, milk, etc.); production of methyl ketones by the action of micro-organisms or light; damage by heating; autoxidation (catalysed by metals) to give peroxides and volatile breakdown products (some of which are toxic); and flavour reversion (of unsaturated fatty acids, with production of aldehydes), catalysed especially by copper, and less dependent on atmospheric oxygen than true autoxidation. Autoxidation is the most important cause of deterioration; its rate increases with degree of unsaturation of the fats, with temperature, with exposure to light (which also hastens destruction of peroxides), and with extent of surface exposed to air; it is affected by physical structure (e.g. presence of an aqueous phase), and by antioxidants. Autoxidation of fats can be lessened by avoiding contact with metals or air, and keeping the oils in a cool place, in the dark, or in non-transparent containers.

Antioxidants may be added if necessary, if they are really effective, and if their use is sanctioned by the food laws of the country. Antioxidants may be (1) primary, breaking the autocatalytic reaction chain ending in formation of peroxides, (2) synergists, probably acting by supplying hydrogen to primary antioxidants, or (3) effective by delaying subsidiary reactions of autoxidation. Most primary antioxidants are phenolic; some are only suitable for inedible fats. Tocopherols, approved in some countries because they are natural constituents of vegetable oils, are apt to produce disagreeable flavours when added to animal fats. Nordihydroguaiaretic acid is effective, but expensive, and liable to affect the flavour of the food when it is heated. The dodecyl, octyl, and propyl esters of

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 ABSTRACTER: Reprinted in whole

REFRIGERATED CARGO UNIT

FROZEN FOOD TRANSPORT

FISH CANNING PROBLEMS

ANTIOXIDANTS FOR FATS

3.26

which was fairly well insulated (heat leakage coefficient 130 Btu/°F./hr.) but with small bunkers; during the journey the cars operated practically as insulated boxes without any coolers. Figure 5 shows two typical curves; temperature measurement was just below the surface of the meat.

Discussion. -- The data for the roof-tank car was obtained under very good loading conditions. In spite of this, temperature rises on the extreme top of the stack ranged from 5° C. to 8.5° C. which were partly recovered later in the journey. The "loading" losses would have been much greater if special precautions had not been taken to restrict warming during loading. However, the average temperature rise due to loading throughout the whole stack was small.

For the end bunker car the temperature rises at the top of the car were much greater and there was no recovery of the losses later in the trip.

The data for beef shown in figure 5 were obtained under less satisfactory loading conditions but were still better than average. Temperature rises of much greater magnitude than shown in figure 1 were obtained.

Conclusions. -- 1. Temperature rises due to loading conditions will usually be the main factor governing the maximum temperature in frozen foods on fairly short journeys even when elaborate precautions are taken to restrict loading losses.

2. Loading losses are usually greatest on the top of the stack. They may be partly recovered during the journey in roof tank cars and, presumably in fan cars, but not in ordinary end bunker cars.

3. For close control of maximum cargo temperatures it seems essential to have a flow of cooled air over every face of the stack.

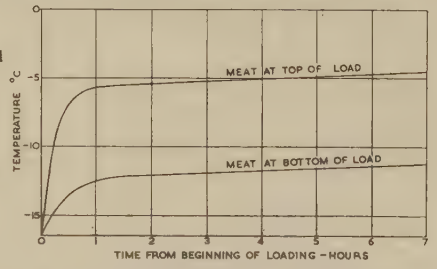

Fig. 5. -- Temperatures in frozen beef crops (fore-quarters) stowed horizontally in a precooled insulated vehicle. Outside temperature 32° C.

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gallic acid, butylated hydroxyanisole, and m- and p-dibutylated cresols (butylated hydroxytoluene) are now favoured. These phenolic antioxidants delay the formation of peroxides and the development of rancid flavour in fats, except in butter, in which formation of peroxides is delayed, but rancid flavour still develops.

Changes of flavour in butter are catalyzed by enzymes; these may be inhibited by addition of very small amounts of tetraethyl thiuram disulphide, which combines with copper to give a compound insoluble in the aqueous phase, but soluble in the fat. The use of this substance has, however, been objected to because of the toxic, effect it has in combination with alcohol. In several fats, rancid flavour is apparent before any increase in peroxide content; this does not occur in the presence of a mixture of dodecyl gallate and butylated hydroxytoluene. A list is given of the requirements that should be satisfied by an antioxidant before its use in food fats is permitted. These requirements are met by the phenolic antioxidants discussed. Butylated hydroxytoluene has the drawback that its presence in foods in low concentrations cannot at present be established with certainty; the same applies to the non-phenolic substance, tetraethyl thiuram disulphide.

3.3

Effect of heat processing. -- Excessive heat processing in the retort will cause increased shrinkage, which is evidenced by a decreased drained weight of the can contents, and may cause the chemical breakdown of some of the components of the flesh such as trimethylamine oxide, and the chemical changes characteristic of the Maillard sugar-protein reaction, resulting in a brownish discoloration of the white flesh. In fish canning one of the major problems is still to find a practical method of preventing "scorch." The technological problems involved are: (1) the determination of the optimum time/temperature relation of processing; (2) strict, preferably automatic retort control; (3) keeping recording thermometer records, and (4) increased attention to proper, rapid cooling procedures.

New products. -- The development of new and special canned fish products is always a challenge to the industry. This may take the form of using canning as a new method of preservation for a particular species, preparing dietetic packs, or canning prepared dishes using fish as shellfish as a base. The testing of new recipes suitable for canning opens a wide field of development for specialty products.

Engineering problems. -- The engineering problems in fish canning fall into two main categories:

(a) the mechanization of procedures through development and introduction of new and improved equipment, and (b) the use of new materials in the construction of cannery equipment to eliminate all danger of metallic trace elements contaminating the fish flesh.

3.338 IRON SULFIDE DISCOLORATION OF TUNA CANS. NO. 4 EFFECT OF RETORTING AND COOLING CANNED FISH

Pigott, George M.; Stansby, M. E. (Fishery Technological Laboratory, Seattle, Washington)
Commercial Fisheries Review 18, 13-16 (December 1956)

Introduction. --Iron sulfide deposits that are caused by a reaction between the sulfide from fish and the iron in the can sometimes form inside the can on the area adjacent to the headspace in some lots of canned tuna. Earlier papers in this series have indicated that precooked tuna does not contain free sulfide. The sulfide in the canned product that is available to react with iron, therefore, apparently becomes available during retorting. Iron sulfide discoloration could also be affected by the conditions that exist during the time that the cans are being cooled.

Purpose. --The purpose of this paper is to report the effect of retorting and cooling on the sulfide content and the subsequent discoloration of canned tuna.

Experimental. --To investigate the formation of sulfide as a function of retorting time, the authors precooked local albacore tuna that had been stored at -20° F. for 10 months, packed it into cans (size 307 x 113), sealed the cans, and retorted them at 240° F. for 45, 60, 75, 120, or 360 minutes. The precooked fish did not contain free sulfide at the time that it was packed into the cans. The headspace gases and the meat with liquid obtained from this canned tuna were then analyzed for sulfide.

Retorting results. -- Sulfide increased in amount with each increase in retorting time. The free sulfide that formed during retorting appeared mostly as hydrogen sulfide gas in the headspace of the can also in significant amounts in the meat with liquid. Tin sulfide staining appeared on the inside surface of cans that were processed one or more hours and this staining increased in amount with each increase in the retorting time. Even though the sulfide content of the can contents became greater

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 ABSTRACTER: Martin Heerdt

4.60 COMPARISON OF ANTIOXIDANTS FOR FATS ON AN EQUIVALENT MOLAR BASIS

Everson, C. W.; Miller, G. J.; and Quackenbush, F. W. (Department of Biochemistry, Purdue University, Lafayette, Indiana)
Journal of the American Oil Chemists' Society 34, 81-83 (February 1957)

A method for determination and calculation of the relative effectiveness of antioxidants is proposed. The method, in brief, consists of measuring the induction periods of lard to which the various antioxidants were added, by means of peroxide value measurements, after various storage intervals at 100° C. A "catechol index" was calculated which related on a molar basis the induction period of the particular antioxidant under test to that when catechol was used.

A specially dried lard was used as a substrate. The various antioxidants were dissolved in ethanol and added to 50 gram batches of the lard. To each of 20 microbeakers (inside diameter 11.2 mm., height 1 cm.) were added 0.2 grams of the lard-antioxidant material, employing an automatic pipette. The beakers were placed in a covered petri dish in an air oven at 100 ± 1.5° C. At hourly intervals (or more) a microbeaker was removed and a Wheeler peroxide value determined.

The catechol index was calculated thus:

$$\text{Catechol index} = \frac{I_a - I_o}{\frac{M}{I_c - I_o}}$$

when I_a = induction period when antioxidant was used
I_o = induction period with pure lard
I_c = induction period when catechol was used at a concentration of 1 micromole per gram of lard
M = concentration of the antioxidant in the lard expressed as micromolar equivalents per gram of lard.

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 ABSTRACTER: M. E. Stansby

3.338 TRANSPARENT VINYL CAN

Anonymous
Modern Packaging 30, 223 (March 1957)

A transparent vinyl can recently introduced in Western Germany and now appearing in increasing quantity there as a container for herring, salmon, margarine, and similar items incorporates a number of innovations that are significant and show promise.

The body of the can is made of calendered, clear, 8-mil polyvinyl chloride sheet, which is unplasticized and therefore should present no problem of toxicity or embrittlement under refrigeration. The plastic body is formed from roll stock by a stamping machine in the packager's plant, thus minimizing transportation and storage space. The use of a vacuum-formed vinyl cover and a died-out, crimp-on, metal sealing ring together provide top-side visibility and a strong hermetic seal.

The containers, regardless of size, consist of three components: (1) the stamped plastic base, (2) the formed transparent lid, and (3) the metal rim, which is lithographed with the customary label information.

Advantages claimed for the plastic-metal container, aside from being closable on can-type equipment, are its transparency; strong, dent-free construction; and significant reduction in tare weight. An unfilled container is said to weigh only one-third as much as a metal can of similar capacity.

In the crimping of the metal rim, a raised chime is produced. The rim comes with the edge turned down. The closing machine folds this edge in and up against the under side of the flange of the vinyl base. Both the cover and the base flange are caught by this crimp.

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 ABSTRACTER: Kathryn L. Osterhaug

4.60 ANTIOXIDANTS IN THE FOOD INDUSTRY

Lea, C. H.
Chemistry and Industry No. 40, 1082-1083 (October 13, 1956)

The addition of chemical antioxidants to food, in the way that they are added to rubber and petroleum products, is not at present permitted in this country. A limited use of antioxidants is, however, already permissible in a number of other countries and recent recommendations by the Preservatives Sub-Committee of the Food Standards Committee of the Ministry of Agriculture, Fisheries and Food indicate that we may perhaps follow suit in the not too distant future.

Quite apart from any consideration of the desirability or otherwise of adding antioxidants to foods for consumption by humans or animals we have to concern ourselves with the action of these substances because storage behaviour is often influenced in marked degree by the pro- and antioxidants which foods already contain naturally, or which they acquire fortuitously during handling and processing.

Defects arising from the action of atmospheric oxygen, which can sometimes be combated by the use of antioxidants, include loss of natural "fresh" aroma and flavour, the development of "rancid" or other "off" odours and flavours, discolorations and loss of nutritive value due to the destruction of vitamins A, E and C.

Antioxidants which have been found useful in fats and other foods are usually ortho- or para-substituted phenolic compounds. Many of these occur naturally, e.g. the tocopherols (Vitamin E), gallic and caffeic acids, flavonols such as quercetin and rhamnetin, and tannins. Others are synthetic compounds, such as "BHA" and "BHT" which have been "taken over" from the petroleum industry. Certain aromatic amino compounds have found a very limited use, as for the preservation of carotene in

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DISCOLORED CANNED TUNA

PLASTIC CONTAINERS

ANTIOXIDANT EVALUATION

ANTIOXIDANTS FOR FOODS

3.338

The plasticized vinyl, in addition to very good strength characteristics, has excellent resistance to transmission of water vapor and is highly resistant to grease and oils.

The German foods currently using the container are not heat-processed in package.

4.60

dried lucerne and for the stabilization of synthetic Vitamin A.

A second large class of substance includes synergists and metal deactivators, which reinforce the antioxidant activity of the primary inhibitors, often by complexing traces of prooxidant metals. Substances of this type, such as citric acid and its oil-soluble mono-esters can help to protect edible fats and oils against traces of copper and iron picked up from the plant during processing. Ascorbic acid is also a useful inhibitor of enzymic browning in fruits and vegetables, a form of deterioration due to the oxidation of polyphenolic constituents under the influence of a copper-containing enzyme.

Rendered animal fats contain relatively little natural antioxidant and can often be stabilized in some degree by the addition of vegetable materials richer in natural inhibitors. The smoking process as applied to bacon or fish, provides another means of incorporating phenolic antioxidants which help the fat to resist the development of rancidity.

When chemical antioxidants are to be added directly to foods elaborate precautions must be taken, by extensive feeding tests with animals over long periods, to ensure that no appreciable hazard to health results. Just how to ensure a satisfactory standard without unnecessarily restricting progress by over-caution is a question causing much concern at present not only in connection with antioxidants but for all non-nutrient chemicals which find their way into food by whatever route or for whatever purpose.

3.338 (Cross Reference: 3.331)

than was found under normal conditions, ferrous sulfide discoloration did not appear in this lot of canned tuna.

Analyses showed appreciable amounts of sulfide (56 to 151 micrograms per can) in commercially canned discolored tuna and (116 to 648 micrograms per can) in experimentally canned but not discolored tuna. When sodium sulfide was added to the cans of tuna before they were sealed iron sulfide did not form. Ferrous salts suspended in water and painted on the can lids used in the experimental packs, however, did cause extensive deposits of ferrous sulfide to form in the experimental packs. The presence of ferrous iron and not the amount of sulfide, therefore, is the controlling factor in can discoloration.

Cooling results. -- To investigate the formation of sulfide as a function of cooling time, the authors precooked albacore and yellowfin tuna that had a history of causing can discoloration, packed the tuna into cans (size 307 x 113), sealed the cans, retorted them for 75 minutes at 240° F., cooled them at room temperature, and opened them after 30, 60, 120, 240, or 420 minutes of cooling. Discoloration was absent immediately after retorting. However, the first specks of iron sulfide appeared after about one hour of cooling; and these specks continued to grow in size and number until after about 10 hours of cooling. Maximum discoloration was reached after about 24 hours of cooling. When canned and retorted tuna were held in constant temperature baths at temperatures in the range 64° F. to 216° F. for 21 hours after retorting, can discoloration was at a maximum after 21 hours. This discoloration became progressively more noticeable with each increment in the temperature of the bath.

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The induction period of a sample was taken as the point on the peroxide value versus time graph at which a peroxide value of 20 intersects a regression line fitted to peroxide values between 15 and 80. Reproducibility of induction period measurement is shown in table 1.

Table 1
Variation in Induction Periods Between Replicates
(Analyses made on different days)

Lard	Antioxidant	Conc.[a]	Induction periods (hours)	Average variation[b]
				%
A	None	...	2.18, 2.10	1.9
B	None	...	2.19, 2.01, 2.25	4.2
C	None	...	1.88, 2.06	4.6
D	None	...	1.90, 1.95, 1.90	2.0
A	NDGA	0.5	9.04, 8.99, 9.29	1.3
B	NDGA	0.5	9.96, 9.78	0.9
C	NDGA	0.5	9.95, 10.20, 9.85	1.3
D	NDGA	0.5	7.00, 7.14, 7.01	0.8
A	Catechol	1.0	7.57, 7.48	0.5
D	Catechol	1.0	5.47, 5.60, 5.53	0.7
D	Hydroquinone	1.0	4.54, 4.66, 4.16	4.5

[a] Micromols per gram of lard.
[b] Average variation from the mean value, expressed as percentage of the mean value.

Catechol indices for some antioxidants were found to be as follows: NDGA 1.41; hydroquinone 0.78; α-tocopherol 0.31; butylated hydroxyanisole 1.25; gallic acid 2.97; and propyl gallate 1.87.

4.64 ANTIOXIDANTS: ANOTHER MILESTONE IN ANIMAL FEEDING

Scott, M. L. (Cornell University, Ithaca, New York)
Feedstuffs 29, 45-48 (March 2, 1957)

Four of the many antioxidant compounds investigated to date have been found to be outstandingly effective as antioxidants for feeds and feed ingredients. These are butylated hydroxytoluene (BHT); butylated hydroxyanisole (BHA); 6-ethoxy-2, 2, 4-trimethyl-1, 2-dihydroquinoline (Santoquin); and diphenyl-para-phenylene diamine (DPPD). Unfortunately, DPPD was found toxic for use because it interfered with reproduction in mammals. As a consequence, DPPD has been barred from commercial use in feeds by the Food and Drug Administration.

A recent study by Siedler and associates (1956) shows that antioxidant-treated animal fat is very effective for increasing the stability of vitamin A, carotene, and fat in commercial poultry feeds stored at 100° F. Feeds prepared without added fat and with fat that did not contain an antioxidant were used as a comparison. The results of this study are summarized in table 1 (see over).

In a further study in which BHT, Santoquin, and DPPD were compared at the 0.1 percent level, all three antioxidants were found to be equally effective. The results in table 2 (see over), show that carotene and vitamin A can be preserved through the use of antioxidants. The level of BHT required for best effect may be slightly more than 0.0125 percent, however, the level is decidedly less than 0.1 percent.

See tables, over.

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 ABSTRACTER: Martin Heerdt

5.2 THERMAL DESTRUCTION RATES OF THIAMINE IN PUREED MEATS AND VEGETABLES

Feliciotti, E. and Esselen, W. B. (Department of Food Technology, University of Massachusetts, Amherst)
Food Technology 11, 77-84 (February 1957)

Purpose. --Studies were made to determine the kinetics of thiamine destruction at 228°, 246°, 264°, 282°, and 300° F. in Sorensen's phosphate buffer solutions at pH 4.5, 5.0, 5.5, 6.0, 6.5, and 7.0; in aqueous solution at pH 3.5; and in pureed vegetables and meats.

Experimental. --To prepare thiamine stock solution, 200 milligrams (mg.) of U.S.P. crystalline thiamine chloride hydrochloride was dissolved in 25 percent ethyl alcohol and brought to a volume of 100 milliliters (ml.). Thiamine stock solution (1 ml.) was diluted to 500 ml. with one of the buffer solutions and a series of buffered thiamine solutions of desired pH was prepared. Thiamine stock solution (1 ml.) was also diluted to 500 ml. with distilled water to prepare an aqueous thiamine solution (pH 3.5). Two ml. portions of the various buffered thiamine solutions were pipetted into Esty and Williams thermal death-time tubes. The tubes were then sealed in an oxy-gas flame and stored at 0° F. until ready for use.

Thiamine solution samples were heated for time intervals such as 0, 30, 60, 80, 150, and 240 minutes in a miniature Schmidt retort in groups of 3 tubes of each sample for each time and temperature interval. Three control samples were also carried through the entire procedure except for heating. For analysis, 1 ml. of sample was diluted to a volume of 25 ml. and acidified with 25 percent potassium chloride. Aliquots of 5 ml. were used for analysis by the method of the Association of Vitamin Chemists. Fluorescence was measured in a Model 12-B Coleman Electronic Photofluorometer with quinine sulfate (300 micrograms (μg) per ml.) as a standard.

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 ABSTRACTER: Martin Heerdt

4.92 BIOLOGICAL EFFECTS OF THE POLYMERIC RESIDUES ISOLATED FROM AUTOXIDIZED FATS

Kaunitz, Hans; Slanetz, Charles A.; and Johnson, R. E. (Department of Pathology, and Institute of Research in Animal Diseases, Columbia University, New York); Knight, H. B.; Saunders, D. H.; and Swern, Daniel (Philadelphia, Pennsylvania)
Journal of the American Oil Chemists' Society 33, 630-634 (December 1956)

There is increasing evidence that the abnormal nutritional properties of highly autoxidized fats are related to the polymers which develop during autoxidation. Lard and cottonseed oil were aerated at 95° C. for 200 hrs. and molecularly distilled; and the residue fractions, non-volatile at 275° to 300° C., were studied.

Diets containing 20% of autoxidatively produced polymeric residue, fed to albino rats, led to diarrhea and rapid death, but when this residue was reduced to 10%, most of the animals were gradually able to tolerate it. At the 4 or 7% level it was well tolerated, but growth was reduced. There were no distinctive histological lesions, and withdrawal of the polymer permitted immediate realimentation without evidence of subsequent injuries.

The polymeric residue from autoxidized cottonseed oil exerted a greater growth-depressant effect than that from lard, and the latter, more than that from a hydrogenated vegetable oil used for deep-fat frying for 80 hrs. at 190° C. Addition of fresh fat to the polymeric residues decreased their growth-depressant effect.

When rats were fed a measured amount of diet sufficient to maintain their weight, the caloric requirement necessary for weight maintenance gradually decreased. When the dietary fat source consisted of polymeric residue to the extent of 4 to 10%, the caloric requirement for weight maintenance decreased relatively little, if at all. The polymeric residue from autoxidized lard was, in this respect, as effective as that from autoxidized cottonseed oil.

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 Authors' summary

7.81 AMINES IN FISH MUSCLE I. COLORIMETRIC DETERMINATION OF TRIMETHYLAMINE AS THE PICRATE SALT. II. DEVELOPMENT OF TRIMETHYLAMINE AND OTHER AMINES

Dyer, W. J. and Mounsey, Yvonne A. (Atlantic Fisheries Experimental Station, Halifax, N. S.)
Journal of the Fisheries Research Board of Canada 6, 351-367 (October 1945)

Colorimetric determination of trimethylamine as the picrate salt. -- The authors have developed a sensitive and accurate colorimetric method for estimating fish spoilage. They have accomplished this by measuring the amount of trimethylamine that is produced when fish spoil.

Method. -- A sample of fish muscle tissue containing 0.002 to 0.020 milligrams of nitrogen as trimethylamine was made alkaline with potassium carbonate in the presence of formaldehyde. This sample was extracted with toluene, and the extract was dried. The dried extract was taken up with a toluene solution of picric acid, and the yellow color of the trimethylamine picrate was measured in a colorimeter. This yellow color was found to be stable and to obey Beer's law over the range 0.002 to 0.020 milligrams of nitrogen.

Results. --The colorimetric method based on the picrate salt of trimethylamine gave results that were in satisfactory agreement with the Conway distillation method for the determination of trimethylamine resulting from spoilage in fish and fish products. Ammonia, amino acids, choline, betaine, urea, and guanine did not cause interference, whereas methylamines and ethylamines did cause some color interference. The higher amines produced during protein putrefaction also combined with the picrates to give color interference.

Development of trimethylamine and other amines. -- A suspension of minced fresh cod muscle

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 ABSTRACTER: Martin Heerdt

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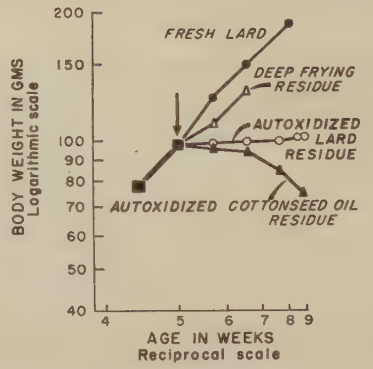

Fig. 2. Growth of rats fed fresh lard and polymeric residues from three autoxidized fats at a 10% level in the diet.

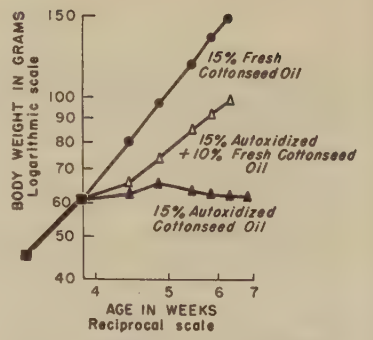

Fig. 3. Growth of rats fed 15% fresh cottonseed oil, 15% autoxidized cottonseed oil, 15% autoxidized cottonseed oil + 10% fresh cottonseed oil.

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tissue in an equal weight of distilled water was incubated at 20° C. and allowed to spoil. Bacterial proteolysis first produced trimethylamine after which relatively large amounts of non-volatile higher amines were formed. Similar results were obtained with muscle tissue from fresh cod fillets stored at 2° C. The higher non-volatile amines occurred only in the advanced stages of deterioration of the muscle tissue after trimethylamine values had reached 60 to 80 milligrams of nitrogen per 100 grams of muscle. These values indicate that food poisoning from higher amines, many of which are active physiologically, is possible if badly spoiled fish muscle is ingested.

Assays for trimethylamine by the colorimetric method and by the Conway method were in close agreement, and showed about 0.2 milligrams of nitrogen per 100 grams of muscle in fresh cod and haddock. The authors found that dimethylamine gave only 20 percent as much color as trimethylamine gave in the form of the picrate salt. Dowden's method was studied, modified, and used by the authors for the determination of dimethylamine in fish muscle extracts.

Results obtained by the Conway distillation method of extraction showed that the trimethylamine in fish muscle could be completely extracted with either trichloracetic acid or formaldehyde solution. The recovery of trimethylamine that had been added to fish muscle was 98.0 percent by the distillation method of extraction, 100.0 and 102.0 percent by the trichloracetic acid method of extraction, and 97.0 and 105.0 percent by the formaldehyde method.

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Table 1.--Summary of Effects of Antioxidants Upon Carotene and Vitamin A Losses at 6, 10 and 14 Weeks' Storage In a Commercial-Type Poultry Feed at 100° F.

Weeks	None	6% Fat, No antioxidant	6% Fat + BHA	6% Fat + Santoquin	6% Fat + BHT	6% Fat +BHA + BHT	6% Fat + DPPD
				Carotene loss, %			
6	69	41	31	17	21	27	17
10	84	68	41	23	28	36	25
14	93	87	72	47	56	66	53
				Vitamin A loss, %			
6	52	31	25	17	23	21	28
10	67	60	40	21	27	29	24
14	90	85	77	38	56	65	47

All antioxidants used at level of 0.02% total antioxidant.

Table 2.--Effect of BHT, Santoquin and DPPD Upon Carotene and Vitamin A Stability When Used at the 0.1% Level in Feed Stored at 100° F.

Weeks	None	6% Fat, No antioxidant	6% Fat, 0.1% Santoquin	6% Fat, 0.1% BHT	6% Fat, 0.1% DPPD
		Carotene content, U.S.P. units/gm.			
0	9.0	9.5	10.0	9.7	9.7
6	1.7	4.9	8.7	7.5	8.7
10	1.0	1.4	8.6	8.1	8.8
14	0.5	0.5	7.2	6.3	6.3
			Vitamin A		
0	14.5	14.8	14.3	14.5	14.8
6	3.2	7.1	11.6	12.4	11.9
10	2.4	2.3	11.2	11.9	11.9
14	0.6	1.2	9.4	9.4	9.4

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Food samples containing natural thiamine were heated in metal death-time cans which are 2½ inches in diameter and 3/8 inch in depth.

Results.--A first order type of reaction was involved in the thermal cleavage of the thiamine molecule in the range 228-300° F. The energy of activation for the breakdown of thiamine in the different media was 27 to 28.8 kilogram-calories per mole. In phosphate buffered solutions in the pH range of 4.5 to 7.0, the rate of thiamine destruction increased with each increase in pH. The change in the rate of reaction was most pronounced in the range pH 6.0 to 6.5. Thiamine destruction showed a temperature coefficient, Q_{10}, value of 2.5 irrespective of pH or the substrate composition. Thiamine was more resistant to breakdown in foods than as pure thiamine in aqueous or buffered solutions. Thiamine solutions of a pH similar to that of specific foods showed rapid rates of destruction, whereas thiamine destruction in the actual foods was independent of differences in pH. The authors believe, therefore, that the thermal destruction of thiamine in foods may be dependent upon the interrelationship of pH and the relative proportions of the free and combined forms of the vitamin. At a given pH, the rate of thiamine destruction increased with each increase in the amount of combined thiamine that was present.

The thermal destruction of thiamine in spinach, beef heart, beef liver, and lamb was more rapid than in carrots, green beans, peas, and pork.

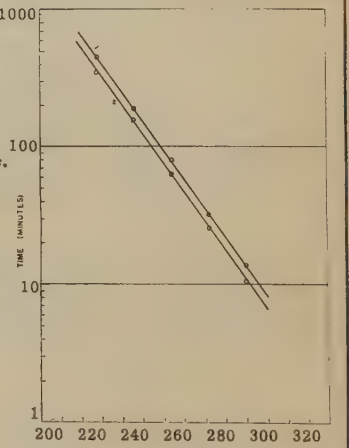

Fig. 3. Thermal destruction time (time for 90% destruction) curves for thiamine in strained foods. Curve 1, average curve for carrots, green beans, peas, and spinach; curve 2, average curve for beef heart, beef liver, lamb and spinach.

6.134 PREPARATION OF A DRY PRODUCT FROM CONDENSED MENHADEN SOLUBLES

Lee, C. F. and Monroe, R. J.
Special Scientific Report: Fisheries No. 194 (December 1956) United States Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.

A statistical analysis has been made, as a supplement to U. S. Fish and Wildlife Service Research Report 45, Preparation of a Dry Product from Condensed Menhaden Solubles.

Simple correlation studies show that 4 of 10 chemical and physical characteristics are important in preparing suitable dry condensed solubles. These are ammonia, corrected protein content, total ash and water insoluble matter, and desirable limits are suggested for each.

Multiple correlation studies of other selected data show that the specific gravity of condensed solubles is largely determined by its total ash and fat content. Dry solids content and the refractive index or specific gravity are not correlated either separately or in combination. The study indicates that the variability in composition of condensed solubles does not account for either the extreme variation in viscosity of the condensed solubles or for differences in moisture-absorptive characteristics of the related dry solubles.

By means of an analysis of variance it was shown that the solubles produced by plants in the South Atlantic and Gulf of Mexico areas differed in composition from the product of plants in the Central Atlantic area. Otherwise, there were not sufficient data to permit determination of the effect of type of plant or of the month of production upon the properties of the condensed solubles.

Authors' summary

7.879 2-THIOBARBITURIC ACID METHOD FOR THE MEASUREMENT OF RANCIDITY IN FISHERY PRODUCTS

Yu, T. C. and Sinnhuber, Russell O. (Oregon Agricultural Experiment Station, Seafoods Laboratory, Astoria, Oregon)
Food Technology 11, 104-108 (February 1957)

Introduction. -- This report is concerned with the rancidity caused by the action of air on fat or fatty tissue in fishery products. Bernheim et al. (1947) demonstrated a new method for measuring rancidity by incubating certain tissues with 2-thiobarbituric acid (TBA). The light pink to deep red colors which resulted were a product of the oxidation of the unsaturated lipids. Fridriksdottir (1953) used the TBA reaction to study the oxidative rancidity of frozen herring. She encountered difficulty in the removal of color pigment from the fish protein and in the preparation of clear solutions for color comparison and concluded that the test was not suitable for the estimation of the degree of rancidity even if it did distinguish between rancid and non-rancid samples.

Purpose. --This report describes a simple procedure whereby an intact sample is used to eliminate fat extraction which can be difficult, incomplete, and time consuming when making a TBA determination.

Experimental. --Five reagents are needed. Number 1, trichloroacetic acid solution, was made by dissolving 20 grams (g.) of reagent in distilled water. The resulting solution was diluted to a volume of 100 millimeters (ml.) with distilled water. Number 2, pyridine hydrochloride solution, was made by mixing 30 ml. of pyridine with 70 ml. of 6 normal (N) hydrochloric acid. Number 3, TBA reagent, was made according to the method of Kohn and Liversedge (1944) except for the charcoal treatment. Number 4, a combination reagent, was prepared by mixing 650 ml. of 0.6 N hydrochloric acid with 50 ml. of trichloroacetic acid solution and adding 50 ml. of pyridine hydrochloride solution. Number 5 was Skellysolve F petroleum ether. The apparatus for the assay included a 250 ml. flat

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ABSTRACTER: Martin Heerdt

7.879 APPLICATION OF THE THIOBARBITURIC ACID TEST AS A QUANTITATIVE MEASURE OF DETERIORATION IN COOKED OYSTERS

Schwartz, Mark G. and Watts, Betty M. (Department of Food and Nutrition, The Florida State University, Tallahassee)
Food Research 22, 76-81 (January-February 1957)

Introduction. -- Oysters that have been heated sufficiently to destroy their catalase enzyme go through a type of spoilage that is characterized by the development of stale or rancid fish odors. These odors are believed to be associated with the oxidation of unsaturated fats.

Purpose. -- The authors applied the thiobarbituric acid (TBA) test to oysters in an attempt to establish a rapid method for determining oxidative rancidity.

Materials. -- Gulf oysters (Crassostrea virginica) from Cat Point Reef in the Gulf of Mexico were purchased freshly shucked from a commercial oyster house and divided into 2 lots. Oysters in lot 2 only, were cooked in water for 2½ minutes at 90° to 95° C. Oysters in each lot were then packed into glass jars, covered with aluminum foil, and stored for 12 days at 4° C.

Methods. -- The TBA test that Turner et al. (1954) used for frozen pork was modified for use in this study. The procedure in detail is as follows:

Oysters (100 grams), are combined with 100 milliliters (ml.) of water in a Waring Blendor. Five grams (g.) of the oyster blend, 5 ml. of 20 percent trichloracetic acid in 2 molar phosphoric acid, and 10 ml. of 0.01 molar 2-thiobarbituric acid are combined in a 50 ml. centrifuge tube, heated for 10 minutes in boiling water, and chilled for 10 minutes in an ice bath. A pink colored TBA complex

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ABSTRACTER: Martin Heerdt

8.51 THE AMINO ACID COMPOSITION OF FISH COLLAGEN AND GELATIN

Eastoe, J. E. (The British Gelatine and Glue Research Association, London, England)
The Biochemical Journal 65, 363-368 (February 1957)

Purpose. -- This investigation provides information about the composition of collagen from 4 species of fish.

Experimental materials. -- The experimental materials used in this study were sturgeon swim-bladder collagen (commercial isinglass) from the Beluga sturgeon (Acipenser huso huso), gelatin from cod (Gadus morrhua) vertebrae, shark-skin gelatin from the shark (Selachus maximus), and collagen and gelatin from the skin of the Australian lung fish (Neoceratodus) which had been preserved by salting and drying.

Experimental methods. -- Collagen and gelatin proteins were sealed in tubes with 100 times their weight of 20 percent hydrochloric acid and hydrolyzed at 100° C. for 24 or 48 hours. These hydrolysates were assayed for amino acids by the resin chromotography methods of Moore and Stein (1951). Hydroxyproline was determined by the method of Neuman and Logan (1950). Kinematic viscosities of 6.67 percent weight for weight aqueous solutions of the gelatins were measured at pH 6 to 6.5. After the gels were allowed to mature for 17 hours at specified temperatures, they were used for rigidity determinations that were made according to the method of Saunders and Ward (1953). Shrinkage temperatures were measured by visual observations of water-saturated samples suspended in toluene.

Results. -- The amino acid content of fish collagens and gelatins was calculated on the weight of dry, ash-free protein. Total nitrogen recovery ranged from 97.6 to 102.5 ± 2 percent experimental error. Recovery by weight ranged from 93.7 percent for the collagen of lung-fish skin to 99.2 percent for the collagen of sturgeon swim bladder. These values are lower than corresponding values for mammalian materials; they also suggest a higher non-nitrogenous component in some of the fish

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ABSTRACTER: Martin Heerdt

DRYING MENHADEN SOLUBLES

TBA TEST FOR OYSTERS

TBA TEST FOR RANCIDITY

FISH COLLAGEN AND GELATIN

7.879 (Cross Reference: 1.81)

develops during heating. To extract this complex from the aqueous phase, 15 ml. of a solvent mixture containing 2 parts of isoamyl alcohol and 1 part of pyridine is added to each tube. The tubes are shaken vigorously for two minutes, and centrifuged for 15 minutes at 2400 rpm to break the emulsion that forms during extraction. The solvent extract in 5 ml. amounts is diluted with 5 ml. of the solvent and the color of a portion of this mixture in a cuvette, is measured at 540 millimicrons (mμ) against a solvent blank in a Beckman spectrophotometer.

An interfering yellowish brown pigment similar to that described by Caldwell et al. (1955) in cereal products is found in the oyster extracts in addition to the pink color obtained with TBA. The interfering pigment can be removed without simultaneous extraction of the pink complex if oyster tissues, after their reaction with the TBA reagent, are extracted with three 15-ml. portions of ethyl ether.

Results and discussions. -- Odors were rated organoleptically at 3-day intervals. Cooked oysters received a rating of fresh in odor up to and including 6 days of storage. By the ninth day, the cooked sample had a definite rancid fish odor that increased in intensity between the ninth and twelfth day of storage. At no time did the raw oysters develop a rancid fish odor. TBA values for the cooked oysters showed an abrupt change after six days and a rapid increase through the twelfth day. A very close correlation was found between the time of the sharp increase in TBA values and the development of the rancid fish odor. The TBA values of raw oysters showed no consistent increase and fluctuated radically until bacterial spoilage was evident. Insufficient data are available to establish a TBA value for cooked oysters which would identify them as being rancid.

Fresh oysters (1 part by volume) were also cooked for 2½ minutes at 70° to 75° C. with and without an antioxidant in (3 parts by volume) the cooking water. This antioxidant contained 74 percent propylene glycol, 20 percent butylated hydroxyanisole (BHA), 4 percent anhydrous citric acid, and 2 percent NDGA; it was added to the water in a concentration of 0.1 percent BHA. Oysters cooked with the antioxidant and oysters cooked without the antioxidant were packed separately in glass jars, covered with aluminum foil, stored at 4° C. and examined at three-day intervals. The results show the same general pattern that was established with cooked oysters in the previous experiments. Oysters cooked with the antioxidant retained their oyster odor. TBA values in both samples could be correlated with organoleptic ratings.

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proteins. Traces of cysteic acid and possibly cystine were detected in the hydrolysates. These amounts did not exceed 0.1 percent. Tryptophan was not determined. The fish collagen showed an amino acid distribution similar to the amino distribution of mammalian collagen but with smaller amounts of proline and hydroxyproline and larger amounts of serine, threonine and in some cases methionine and hydroxylysine.

Viscosity values of the gelatins derived from fish collagens were only slightly below those of the mammalian gelatins previously investigated, a finding which suggests that fish and mammal gelatin molecules are of similar average size. Sturgeon, shark, and lung-fish gelatins were somewhat less rigid than mammalian gelatins. These lower values may have arisen through failure to find the optimum conditions for the extraction of gelatin from the fish materials. Cod-bone gelatin had a markedly lower rigidity than gelatin from the other fish. At 10° a 6.67 percent cod gel gave such a low value that the measurement was repeated at 0°. The melting point of this gel was 12° C. compared with 30° C. for mammalian gelatin. Gelatins from cod skin and swim bladder also were found to have greatly diminished gelling properties with 6.67 percent gels melting at 13° C.

Shrinkage temperatures of the collagen and the gel properties of gelatin extracts tended to decrease with decreasing hydroxyproline content.

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bottom boiling flask, a 400 mm. jacketed condenser, a water bath, 50 ml. centrifuge tubes, separatory-centrifuge tubes, and a Klett-Summerson photoelectric colorimeter or Beckman DU spectrophotometer.

Sample treatment. -- Fish meals were prepared from black rockfish scrap and whole flounder by steaming the rockfish 30 minutes, passing it through a grinder, pressing to eliminate liquid, regrinding, drying in a vacuum oven at 100° C. for 18 hours, and grinding in a hammer mill. Fresh fish or scrap were ground, whereas fish fillets and canned products were disintegrated in a Waring blendor.

Procedure. -- Fish meal or fish oil (0.220 - 0.260 g.) was accurately weighed into the boiling flask to which was added 4 ml. distilled water, 5 ml. pyridine hydrochloride solution, 10 ml. trichloroacetic acid solution, and 6 ml. TBA solution. With the condenser in place, the flask was placed in a vigorously boiling water bath and timed immediately to permit exactly 30 minutes of refluxing. The combination reagent (75 ml.) was then added through the top of the condenser. The flask was agitated several times and refluxing was continued 10 minutes. At this stage the flask was cooled in a water bath to room temperature and disconnected from the condenser. Forty ml. of the red colored solution was removed and centrifuged at 1800 rpm. Fifteen ml. of the resulting clear solution was measured into a Hennessy tube along with 10 ml. of petroleum ether, and the mixture was shaken vigorously for 30 seconds. This mixture was then centrifuged for 3 minutes at 1200 rpm, and the clear solution was measured for color density in either a Klett-Summerson photoelectric colorimeter using a No. 54 filter or a Beckman DU spectrophotometer at 535 millimicrons (mμ). Results may be expressed in Klett readings or preferably in $E^{1\%}_{1\,cm}$ at 535 mμ on the Beckman.

Findings. -- Reproducible results were obtained with fish oil, fish meal, canned fish and frozen fish. Fresh fish materials give very little color. The density of the color produced with rancid fish materials and TBA reagent increases markedly during the first 30 minutes and is a function of the reflux time. In many products a relationship was found to exist between taste and TBA values.

0.5 FURTHER STUDIES ON THE RED HALOPHILIC BACTERIA FROM SOLAR SALTS AND SALTED FISH

Venkataraman, R. and Sreenivasan, A.
Proceedings of the Indian Academy of Sciences 43B, 197-207 (March 1956)

(Abstract of this article appears under 3.5 page 9 - December 1956)

0.5 CANNING EXPERIMENTS WITH NON-SPOREFORMING BACTERIA

Williams, O. B.
Food Research 21, 502-504 (July-August 1956)

(Abstract of this article appears under 3.33 page 11 - March 1957)

0.5 MICROFLORA OF THE INTESTINES OF BALTIC COD

Fischer, E.
Prace Morsk. Inst. Ryback, Gdyni No. 8, pp. 387-395 (1955)
Food Science Abstracts 28, 569 (December 1956)

A bacteriological study of the micro-organisms in the intestinal contents of cod caught in the Baltic indicated that the highest count occurred during the period of intense feeding and the minimum during the spawning time. Achromobacter spp. represented 65 percent of the microflora isolated; among the other organisms were species of Micrococcus, Pseudomonas, Flavobacterium, Sarcina, Serratia, and Clostridium.

1.120 LONGLINE FISHING FOR TUNA IN THE CENTRAL EQUATORIAL PACIFIC, 1954

Iversen, Edwin S. and Yoshida, Howard O. (Pacific Oceanic Fishery Investigations, Honolulu, T.H.)
Special Scientific Report: Fisheries No. 184, pp. 1-33 (August 1956) United States Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.

1.2 HEAT AND WATER TRANSFER DURING THE DEHYDRATION OF HERRING FILLETS

Del Campo, M. M. and Cutting, C. L.
Journal of the Science of Food and Agriculture 7, 417-424 (June 1956)

(Abstract of this article appears under 3.63 page 15 - January 1957)

1.2 SOUTH AFRICAN PILCHARD OIL

Whitcutt, J. M. and Sutton, D. A.
The Biochemical Journal 63, 469-475 (July 1956)

(Abstract of this article appears under 4.12 page 19 - February 1957)

1.3 STUDIES ON THE MANUFACTURE OF CANNED SALMON

Tanikawa, Elichi; Motohiro, Terushige; and Shoji, Shigeo
Bulletin of the Faculty of Fisheries Hokkaido University 6, 317-340 (February 1956)

(Abstract of this article appears under 3.30 page 9 - November 1956)

1.5 SPOILAGE OF FISH IN THE VESSELS AT SEA. 4. EFFECT OF REMOVAL OF GILLS ON RATE OF SPOILAGE

Castell, C. H. and Greenough, Maxine F.
Journal of the Fisheries Research Board of Canada 13, 291-296 (May 1956)

(Abstract of this article appears under 2.19 page 7 - January 1957)

1.5 STORAGE TESTS ON FROZEN FRIED FISH STICKS PREPARED FROM PACIFIC COD

Patashnik, Max and Dassow, John A.
Commercial Fisheries Review 18, 15-18 (July 1956)

(Abstract of this article appears under 3.237 page 11 - February 1957)

1.85 COOPERATION AT TAMPA

Anonymous
Southern Fisherman 16, 36-41, 43-49 (March 1956)

(Abstract of this article appears under 9.4 page 19 - November 1956)

1.85 U.S.F. & D.A. APPROVES USE OF SODIUM BISULPHITE TO CONTROL DEVELOPMENT OF BLACK SPOT IN SHRIMP

Anonymous
Fishing Gazette 73, 87 (September 1956)

(Abstract of this article appears under 4.61 page 11 - April 1957)

1.85 DEVELOPMENT OF THE PACIFIC COAST OCEAN SHRIMP FISHERY

Squire, James L., Jr.
Commercial Fisheries Review 18, 1-6 (September 1956)

(Abstract of this article appears under 2.12 page 5 - April 1957)

1.86 A RAPID METHOD FOR DETERMINING SHELL IN CRAB MEAT UNDER ORDINARY LIGHT

Oakley, Margarethe and Breidenback, Andrew W.
Journal of the Association of Official Agricultural Chemists 39, 531-532 (May 15, 1956)

(Abstract of this article appears under 7.89 page 23 - January 1957)

1.86 SUGGESTIONS FOR CRAB MEAT PACKERS AND FOR TRANSPORTERS OF FRESH CRAB MEAT

Anonymous
Commercial Fisheries Review 18, 41-43 (July 1956)

(Abstract of this article appears under 2.5 page 5 - February 1957)

1.86 STORAGE OF LIVE CRABS IN REFRIGERATED SEA WATER

Roach, S. W.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 106, 6-7 (September 1956)

(Abstract of this article appears under 2.15 page 7 - April 1957)

1.86 SEA TREAT FROM THE NORTHWEST

Anonymous
Modern Packaging 29, 154, 165 (June 1956)

(Abstract of this article appears under 3.235 page 9 - February 1957)

1.86 BIOCHEMICAL STUDIES ON THE EGG LIPIDS OF CRAB, PARALITHODES CAMTSCHATICA

Igarashi, Hisanao; Zama, Koichi; and Katada, Muneo
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 6, 358-367 (1956) (English synopsis, tables, and figure)

I. Fatty acids and unsaponifiable matter of acetone-soluble lipid of the unfertilized eggs.

II. Fatty acids and unsaponifiable matter of the fertilized eggs.

1.87 NEW TECHNIQUES FOR FREEZING AND STORING NORTH ATLANTIC LOBSTERS

Peters, John A. and Slavin, Joseph W.
Commercial Fisheries Review 18, 22-23 (July 1956)

(Abstract of this article appears under 2.118 page 5 - February 1957)

2.01 A NOTE ON THE PRODUCTION OF NITRITE FROM HYDROXYLAMINE BY SOME HETEROTROPHIC BACTERIA

Castell, C. H. and Mapplebeck, E. G.
Journal of the Fisheries Research Board of Canada 13, 201-206 (March 1956)

(Abstract of this article appears under 0.5 page 1 - November 1956)

2.01 REPORT ON CHEMICAL INDICES OF DECOMPOSITION IN FISH (HISTAMINE)

Williams, David W.
Journal of the Official Agricultural Chemists 39, 609-611 (August 15, 1956)

(Abstract of this article appears under 7.81 page 17 - April 1957)

2.01 REFRIGERATION OF FISH: PART 2. HANDLING FRESH FISH

Butler, Charles; Dassow, John A.; Carlson, C. J.; Carver, Joseph; and Heerdt, Martin
Fishery Leaflet 428, pp. 1-84 (1956)

(Abstract of this article appears under 3.23 page 11 - May 1957)

2.111 WEARING TEST OF NET

Honda, Katsuji
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 6, 328-329 (1956) (English synopsis, table, and figures)

The coefficient of friction decreases with an increase in time.

2.111 INFLUENCE OF THE LENGTH OF TEST PIECE ON THE BREAKING STRENGTH AND ELONGATION OF NETTING CORD

Honda, Katuji
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 6, 325-327 (1956) (English synopsis, tables, and figures)

The longer the test piece used, the weaker was the strength of the netting cord.

2.111 THE DISTRIBUTION OF STRESS ON THE FISHING NET

Kusama, Hidetoshi; Kondo, Yasushi; and Suzuki, Makoto
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 9, 973-974 (1956)

A strain gauge can be applied to measure net stress. The fundamental form of stress is nearly diamond shape.

2.15 (Cross Reference: 2.118, 3.234)

HANDLING AND REFRIGERATION OF FISH

MacCallum, W. A. (Fisheries Research Board of Canada, Halifax, Nova Scotia)
Canadian Fisherman 43, 22, 24-26 (July 1956)

A review article with 33 references.

2.15 PRESERVING SHRIMP QUALITY AND BEAUTY

Fieger, E. A.; Novak, A. F.; Bailey, M. E.; McConnell, J. N.; Viosca, P., Jr.
Southern Fisherman Year Book for 1956, 16, 21-23, 81-82 (November 30, 1956)

(Abstract of this article appears under 3.12 page 9 - May 1957)

2.15 REFRIGERATION OF FISH: PART 2. HANDLING FRESH FISH

Butler, Charles; Dassow, John A.; Carlson, C. J.; Carver, Joseph; and Heerdt, Martin
Fishery Leaflet 428, pp. 1-84 (1956)

(Abstract of this article appears under 3.23 page 11 - May 1957)

3.18 THE CONTROL OF FOREIGN MATERIALS

Walker, Niles H.
Modern Sanitation, pp. 21-22 (June 1956) (Reprint)

(Abstract of this article appears under 8.8 page 23 - February 1957)

3.18 THE ODOR PROBLEM

Joselyn, H. Nye
The National Provisioner 135, 12-14 (December 29, 1956)

(Abstract of this article appears under 6.135 page 19 - May 1957)

3.18 THE USE OF BACTERICIDAL ADDITIVES IN THE WASHING OF FRESH FISH

Partmann, W.
Kältetech 7, 270-275 (1955)
Food Science Abstracts 28, 146 (April 1956)

Washing of freshly caught fish before freezing only appears to be useful when due consideration is given to factors such as the rate of cooling and general hygienic measures on board ship. On the other hand, washing of filleted fish with suitable solutions of bactericidal or bacteriostatic substances greatly enhances the keeping quality of the fish. Chlorinated brine has not been particularly useful for fish fillets; sodium nitrite and certain antibiotics appear to be quite efficient, although the use of aureomycin for such a purpose would certainly entail much further study before it could become a routine procedure.

3.234 AN INVESTIGATION OF RATE OF SOLIDIFICATION

Cochran, D. L.
Refrig. Engng. 63, 49-56, 92, 94 (1955)
Food Science Abstracts 28, 1692 (August 1956)

In order to study the rate of solidification of liquids, e.g. of foods during freezing, it is necessary to solve a partial differential equation for which the particular solutions are unknown when the technically useful boundary conditions are applied. Some exact solutions have been obtained in the case of a slab, but their applicability is limited; some approximate solutions have also been obtained in several instances, but their applicability is limited to problems where the effects of thermal capacity are not significant.

3.234 FOR QUICKLY CALCULATING COOLER EFFICIENCY, DESIGN

Haugh, Raymond R. (Quartermaster Food & Container Institute, Chicago, Illinois)
Food Engineering 29, 134-137 (January 1957)

Handy nomograph speeds figuring of refrigeration needs and efficiency in food cooling systems.

3.249 FROZEN OYSTERS

Morton, Margaret L. and Dyer, W. J.
Journal of the Fisheries Research Board of Canada 13, 47-51 (January 1956)

(Abstract of this article appears under 1.81 page 1 - October 1956)

3.249 PROGRESS IN PRESERVATION STUDIES ON SOUTHERN OYSTERS

Watts, Betty M.; Lewis, Harvey; Gardner, Elizabeth Ann; and Wentworth, Jane
Fishing Gazette 73, 42, 60, 61 (July 1956)

(Abstract of this article appears under 1.81 page 3 - March 1957)

3.249 STORAGE OF FROZEN ROSEFISH FILLETS

Dyer, W. J.; Morton, Margaret L.; Fraser, Doris I.; and Bligh, E. G.
Journal of the Fisheries Research Board of Canada 13, 569-579 (July 1956)

(Abstract of this article appears under 4.61 page 15 - March 1957)

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

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Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner and Freezer
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletin
Federation Proceedings
Feed Bag (supersedes Flour and Feed)
Feedstuffs
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
Food Technology
Frosted Food Field
Gourmet
Industrial and Engineering Chemistry
Industrial Refrigeration
Institutions
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

3.26 HOUSEHOLD CONSUMER PREFERENCES FOR BREADED SHRIMP AND BREADED FISH STICKS

Kahn, Richard A. and Stolting, Walter H.
Fishery Leaflet 425, 1-105 (September 1955)

(Abstract of this article appears under 3.236 page 11 - February 1957)

3.26 COOPERATION AT TAMPA

Anonymous
Southern Fisherman 16, 36-41, 43-49 (March 1956)

(Abstract of this article appears under 9.4 page 19 - November 1956)

3.26 BOSTON FISHERIES COOPERATIVE FORMED ON FISH PIER

Anonymous
Fishing Gazette 73, 196 (April 1956)

(Abstract of this article appears under 9.4 page 19 - December 1956)

3.4 PROGRESS IN FOOD SCIENCE BY THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Anonymous
Food Manufacture 31, 179-181 (May 1, 1956)

(Abstract of this article appears under 0.6 page 1 - January 1957)

3.4 EFFECT OF CARBON DIOXIDE ON BOTULIN-PRODUCING BACTERIA HEAT-SMOKED FISH

Karnitskaya, N. V.; Firsova, V. I.; Makashev, A. P.; and Aldakimova, A. Ya. (All Union Sci. Research Inst. Fish Ind. and Oceanography, Rostov-on-Don)
Voprosy Pitaniya 15, 49-50 (no date)
Chemical Abstracts 50, 17240 (November 25, 1956)

Heat-smoked fish (no condition of the heat smoking are given) of large (150-200 g.) and small fish can be stored in a 90% CO_2 atm. for 15 days without any signs of spoilage as compared with only 2-3 days for the control fish samples. By storing the heat-smoked fish infected with spores of Clostridium botulinum in the CO_2 atm., the formation of the botulinus toxin was found after 3-5 days at 30° after 9 days at 25°, and after 12 days at 20°; in the case of small-size fish the storage at 20° was prolonged to 16 days before the toxin formation. No toxin formation was found in infected fish stored in a CO_2 atm. at 20 and 25° for 8 days followed by storage at room temp. for 3 days in the absence of CO_2.

5.0 THE VITAMINS OF FISH OILS. II. ANALYSIS, UNITS, CONCENTRATION, AND STABILITY AND STABILIZATION

Creac'h, P. V.
Oleagineux 11, 223-30, 287-99 (1956)
Chemical Abstracts 50, 9685 (July 10, 1956)

5.41 STRUCTURE OF VITAMIN B_{12}

Hodgkin, Dorothy Crowfoot; Kamper, Jennifer; MacKay, Maureen; Pickworth, Jenny; Trueblood, Kenneth N.; and White, John G.
Nature 178, 64-66 (July 14, 1956)

5.42 STUDIES ON UNIDENTIFIED APF IN LIVER ALLEVIATE EFFECT OF A PURIFIED FRACTION OF LIVER ON THE TOXICITY OF PYRIDINE

Tomiyama, Tetuo and Yone, Yasuo
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 4, 257-259 (1956) (English synopsis and tables)

7.42 THE DETERMINATION OF THE MINERAL FORMS OF CALCIUM IN SHELLFISH

Stolkowski, Joseph (Fac. sci., Paris)
Congr. intern. biochim., Resumes communs. 46, 342-3 (1952)
Chemical Abstracts 50, 8926 (June 25, 1956)

7.461 AMPEROMETRIC TITRATION OF CHLORIDE IN TISSUE, SERUM, URINE, AND FECES

Hallaway, Ben E. (Univ. of Minnesota, Minneapolis)
Am. J. Med. Technol. 22, 65-73 (1956)
Chemical Abstracts 50, 10172 (July 25, 1956)

7.47 FERRIC THIOCYANATE PAPER AS AN ANALYTICAL REAGENT IN THE ANALYSIS OF AIR

Deckert, Walter (Hyg. Inst., Hamburg)
Z. anal. Chem. 150, 421-5 (1956)
Chemical Abstracts 50, 10608 (August 10, 1956)

Directions are given for prepg. the test paper from KCNS and ferric alum solns. The test paper can be used for detecting and detg. basic gases in the atm., such as NH_3, amines, and ethylene oxide, possibly in connection with exhalations and emanations in fish meal factories.

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7.53 THE USE OF DIFFERENTIAL CURVES IN THE DILATOMETRY OF FATS

Jasperson, H. and McKerrigan, A. A.
Journal of the Science of Food and Agriculture 8, 46-54 (January 1957)

Differential dilatometric curves, in which the rate of expansion is plotted against temperature, provide a ready means of distinguishing between the melting properties of various fats and fat blends. Characteristic curves are given of single fats, hydrogenated fats and blended fats and they are discussed in relation to their predominant glycerides.

7.591 ANSERINASE AND OTHER DIPEPTIDASE ACTIVITY IN SKELETAL MUSCLE OF CODLING (GADUS CALLARIAS)

Jones, N. R.
The Biochemical Journal 64, 20P (September 1956)

(Abstract of this article appears under 8.59 page 23 - March 1957)

7.591 ELECTROPHEROGRAPHIC BEHAVIOR OF CODFISH PEPSIN

Simonnet, Henri; Labarre, Jules; Trochu, Louis; and Sternberg, Joseph (Inst. natl. agron., Paris)
Resumes communs., 2 Congr., Paris 274--(1952)
Chemical Abstracts 50, 11396 (August 25, 1956)

At pH 2.5-3.5, codfish pepsin fractionates into 2 electrophoretically distinct zones. At pH 8.5-9.5, only a single wide zone is formed. Electrophoretic treatment (I) for 5 hrs. or more with an acid soln. produces a loss or complete disappearance of enzymic activity.

7.80 SENSORY TESTS OF THE QUALITY OF MEAT

Howard, A. (Division of Food Preservation and Transportation, C.S.I.R.O., Cannon Hill, Brisbane, Q.)
Food Preservation Quarterly 16, 26-30 (June 1956)

7.80 QUALITY ENGINEERING IN THE FROZEN FOOD INDUSTRY

Herman, Robert C. (John Hopkins University) and Anderson, James L. (University of Maryland)
Frosted Food Field 23, 18-20 (July 1956)

7.80 STIMULUS VARIABLE AS AN AID IN DESCRIMINATION TESTS

Raffensperger, Elsie L. and Pilgrim, Francis J. (Quartermaster Food & Container Institute, Chicago, Illinois)
Food Technology 10, 254-257 (June 1956)

Information about the variable can be of great help in increasing the sensitivity of discrimination tests but care must be taken that the information is definitely appropriate.

7.81 VOLATILE REDUCING SUBSTANCES (VRS) AND VOLATILE NITROGEN COMPOUNDS IN RELATION TO SPOILAGE IN CANNED FISH

Farber, Lionel and Ferro, Michael
Food Technology 10, 303-304 (July 1956)

(Abstract of this article appears under 3.30 page 11 - March 1957)

7.81 SOME CHEMICAL INDICATORS OF FISH SPOILAGE

Wierzchowski, Jozef
Przemysl Spozywczy 10, 162-5 (1956)
Chemical Abstracts 50, 14995 (October 25, 1956)

7.82 A RAPID VACUUM DISTILLATION PROCEDURE FOR THE DETERMINATION OF VOLATILE ACIDS AND VOLATILE BASES IN FISH FLESH

Tomiyama, Tetuo; da Costa, Antonio A.; and Stern, Joseph A.
Food Technology 10, 614-617 (December 1956)

(Abstract of this article appears under 7.81 page 23 - May 1957)

8.8 SIMULTANEOUS VS. SUCCESSIVE PRESENTATION IN A PAIRED COMPARISON SITUATION

Schwartz, Noel and Pratt, Cornelia H.
Food Research 21, 107 (January-February 1956)

The simultaneous presentation yields stronger preferences than does the successive. In addition the successive paired comparison is vulnerable to the influence of order of presentation, and becomes more so as the interval between samples increases. This phenomenon may be a partial contributor to the lesser preferences obtained with successive presentation, since any non-relevant variable which is operative, yet balanced out, is bound to have a levelling effect upon preference. With simultaneous comparison, on the other hand, order of presentation is eliminated as a contributing variable.

8.8 OBJECTIVE TESTS APPLICABLE TO QUALITY STUDIES OF ICE-STORED SHRIMP

Bailey, M. E.; Fieger, E. A.; and Novak, A. F.
Food Research 21, 611-620 (November-December 1956)

(Abstract of this article appears under 2.19 page 5 - May 1957)

United States
Department of the Interior
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